

# SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1916.

## No. 7, Original.

THE STATE OF WYOMING, COMPLAINANT,

vs.

THE STATE OF COLORADO, THE GREELEY-POUDRE  
IRRIGATION DISTRICT, AND THE LARAMIE-POUDRE  
RESERVOIRS AND IRRIGATION COMPANY.

IN EQUITY.

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At the Capitol of the United States, in the city of Washington and District of Columbia, being the present seat of the National Government of the United States, on the second Monday of October (being the 10th day of the same month), in the year of our Lord one thousand nine hundred and ten, and of the independence of the United States the one hundred and thirty-fifth, The Supreme Court of the United States met agreeably to law.

And afterwards, to wit, on the 29 day of May, A. D. 1911, the following entry appears of record, viz:

No. 20, Original.

THE STATE OF WYOMING, Complainant,  
vs.  
THE STATE OF COLORADO et al.

Mr. Douglas A. Preston, of counsel for the complainant, submitted to the consideration of the Court a motion for leave to file a Bill of complaint.

May 29, 1911.

Which said motion is in words and figures following, viz:

In the Supreme Court of the United States, October Term, 1910.

In Equity.

No. —, Original.

THE STATE OF WYOMING, Complainant,  
vs.

THE STATE OF COLORADO, THE GREELEY-POUDRE IRRIGATION DISTRICT, a Municipal Corporation; The Laramie Poudre Reservoirs and Irrigation Company, a Corporation, Defendants.

*Application for Leave to File Original Bill of Complaint.*

Comes now the complainant in said cause by Douglas A. Preston, Attorney-General for the State of Wyoming and solicitor and of counsel for the complainant, and makes this the application of the said complainant for leave to file in this Court the Bill of Complaint in said cause, and said complainant herewith presents the Bill of Complaint which it proposes to file.

DOUGLAS A. PRESTON,  
*Attorney-General for the State of Wyoming and  
Solicitor and of Counsel for Complainant.*

(Endorsed:) Supreme Court U. S., October Term, 1910. No. 20, Original. The State of Wyoming, complainant, vs. The State of Colorado et al. Motion for leave to file bill of complaint. Filed May 29, 1911.

And on the same day, to wit, the 29th of May, A. D. 1911, the following order appears of record, viz:

No. 20, Original.

THE STATE OF WYOMING, Complainant,  
vs.  
THE STATE OF COLORADO et al.

On consideration of the motion for leave to file bill of complaint herein,

It is now here ordered by the Court that said motion be, and the same is hereby, granted, and process is ordered to issue, returnable on October 9th next.

May 29, 1911.

And on the same day, towit, on the 29th day of May, A. D. 1911, a bill of complaint was filed in the words and figures following, viz:

In the Supreme Court of the United States, October Term, 1910.

In Equity.

No. —, Original.

THE STATE OF WYOMING, Complainant,  
vs.  
THE STATE OF COLORADO, THE GREELEY-POUDRE IRRIGATION DISTRICT, a Municipal Corporation; The Laramie Poudre Reservoirs and Irrigation Company, a Corporation, Defendants.

*Bill of Complaint.*

To the Honorable the Justices of the Supreme Court of the United States, sitting in equity:

The State of Wyoming by Douglas A. Preston, its Attorney General, he being hereunto directed by the Governor of the State of Wyoming, by leave of this Honorable Court first had, brings this its Bill of Complaint against the State of Colorado, The Greeley-Poudre Irrigation District, a municipal corporation, and The Laramie Poudre Reservoirs and Irrigation Company, a corporation, and

Humbly complaining sheweth unto your Honors your Orator, The State of Wyoming,

That your Orator is one of the States constituting the United



States of America, with all the privileges, rights and powers and with all the duties, including the duty of protecting the rights and interests of its citizens possessed or devolved upon any State; that said defendant, The State of Colorado, is one of the States, and as your Orator is credibly informed and verily believes the other defendants, to-wit, The Greeley-Poudre Irrigation District and The Laramie Poudre Reservoirs and Irrigation Company, are corporations created by said defendant The State of Colorado.

That the Laramie River is a natural stream of water originally and immemorially flowing through the public domain of the United States, rising in the mountainous district of Northern Colorado and flowing in a general northwesterly course for about twenty-seven miles in Colorado, thence northerly and northeasterly for a distance of about one hundred and fifty miles in Wyoming and emptying into the North Platte River in the latter mentioned State.

The greater extent of the drainage basin of the Laramie River in Colorado is a mountainous and heavily timbered country, where snows fall in winter to a great depth, which, melting in the spring and summer, have from time immemorial supplied the waters flowing in the channel of the Laramie River and its tributaries, taking its course through, over and across the lands in the valley of said stream, both in Colorado and in Wyoming, thereby both naturally and with artificial aid moistening and irrigating the said lands and rendering the same valuable for domestic, pastoral and agricultural purposes.

Divers tributaries of said Laramie River likewise rise in the mountainous regions of Northern Colorado and discharge their waters into the said Laramie River, either in Colorado or Wyoming, among others being the following, to-wit: East Fork, West Fork, Mill Creek, Fall Creek, Rapid Creek; Springer Creek, Rawah Creek, Spring Creek, McIntyre Creek, Dead Man, Nunn Creek, Brinker Creek, Sand Creek, Porter Creek, Columbine Creek, La Grande Creek, Forrester Creek, Grace Creek, Stuck Creek, Jim Creek and various small tributaries.

Other than said tributaries which originate in Colorado, the water in the Laramie River receives no substantial accession through any tributary stream from the point where the Laramie River intersects the common boundary line between the said States of Colorado and Wyoming except the following streams, to-wit: Chugwater, North Laramie, Sybille, Little Laramie and Fox Creek. A general map of the said drainage basin of the Laramie River and its tributaries and also showing the irrigated lands thereunder within the State of Wyoming, and also showing the location of the tunnel through which defendants are threatening to divert said waters from the said water shed and the region where defendants are proposing to use said waters, is hereto attached marked "Exhibit A."

A further topographical map of so much of the said drainage basin as lies within the State of Colorado is hereto attached marked "Exhibit B."

The area of the water shed or drainage basin of the Laramie River



and its tributaries in Colorado amounts to about three hundred and ninety-five square miles, and the area of the water shed or drainage basin of said River and its tributaries in Wyoming amounts to about three thousand six hundred and thirty-two square miles.

The surface character of the water shed or drainage basin aforesaid in Colorado is chiefly that of a mountainous, rocky, timbered, rough and broken country, while that of the said drainage basin in Wyoming is generally open, rolling, gently sloping or level and arable land. Only a comparatively small part of the said land within the drainage basin of said River in Colorado is of arable character even by the use of artificial irrigation, while much the greater portion of the said drainage basin or water shed in Wyoming is arable and productive when water is used as hereinafter stated.

The lands riparian to the said Laramie River and its tributaries, including all the lands in said drainage basin or water shed both in Colorado and Wyoming, except as watered and rendered fertile by the natural flowage of said stream, in their natural state are for the most part arid and unproductive and require the use of water applied in the form of irrigation to produce agricultural crops or to render the use of such lands profitable to any considerable degree, the annual precipitation upon said lands being insufficient for the growth of profitable crops without such irrigation.

Prior to the commencement of the wrongs herein complained of, and prior to the creation of the Territory of Wyoming under the Act of Congress of July 25, 1868, that portion of the water shed and drainage basin of said Laramie River and its tributaries which is now within the State of Wyoming was within the boundaries and subject to the laws, customs and decisions of the Territory of Dakota. During said time the customs and usages of the people of said Territory of Dakota and the statutes and laws thereof and the decisions of its courts declared, enacted, held and established that each riparian proprietor on said streams, and each of them, had the right to have the waters thereof flow perpetually across and along his lands unpolluted and undiminished save to the extent made necessary by the reasonable use of the waters thereof by other riparian proprietors while passing over and along the lands of said other riparian proprietors.

Since the admission of your Orator as one of the States, in the region in which said lands lie, in accordance with the customs and usages of the people, recognized by the laws and decisions of the Courts of both Colorado and Wyoming, in all cases where prior rights to the contrary have not intervened it has been the custom to divert and apply the waters of the natural streams to supply the deficiency in the annual precipitation to cultivate the lands within the drainage basin of said streams and make the same productive. Under the said customs, usages, laws and decisions it has been established, enacted, held and decided in both States as to the waters of all streams and other sources of water supply where prior rights to the contrary have not intervened that such waters are open for a reasonable appropriation and use for irrigation purposes; that except as aforesaid priority of appropriation gives priority of right; that neither

the point of diversion nor the place nor kind of use of any appropriation or any water appropriated may be changed in such way as to injure any other appropriator from the said stream or source of supply whether such other appropriator be prior or subsequent in point of time. It has likewise in both States for the time aforesaid, by the customs, laws and decisions of the Courts, been established, enacted, held and decided that no appropriation of waters is effected until such waters are applied to a beneficial use, but at the same time that in every case where the waters are actually applied to a beneficial use the date of priority of the appropriation, except as aforesaid, is the time when the work of such appropriation was actually and in good faith commenced, provided that the work proceed with diligence from the commencement to the actual application of the water to the beneficial use, and further that the amount of the appropriation to which each appropriator is entitled is the amount of water actually used not exceeding the amount reasonably necessary for the actual beneficial use to which it is applied.

Long before the creation of the State of Colorado, or the State of Wyoming, and long before the adoption within said water shed of any custom, law or doctrine of prior appropriation, and long prior to the commencement of the wrongful acts and threatened acts herein complained of, the United States of America, the owner and proprietor at the time of all the lands within said water shed, by the Act of Congress entitled "An Act To aid in the construction of a railroad and telegraph line from the Missouri river to the Pacific ocean, and to secure to the government the use of the same for postal, military, and other purposes," approved July 1st, 1862, and the Acts of Congress amendatory thereof and supplemental thereto, granted to the Union Pacific Railroad Company, a corporation created and organized under the said Acts, a large amount, to-wit, more than three hundred and fifty thousand acres of the said lands within the State of Wyoming riparian to the said Laramie River and its said tributaries arising within the State of Colorado and within the drainage basin of said Laramie River and its tributaries last aforesaid. Since said grants the said lands so granted have passed to many different owners, for the most part citizens of your Orator, by means of conveyances and mesne conveyances from, through and under said Union Pacific Railroad Company, by means whereof said lands are owned, possessed and occupied by a large number, to-wit, by more than fifteen hundred persons, for the most part citizens of your Orator. That through and by means of the said grant and conveyances the right to a continued flow of the said water in its accustomed channel was granted by the United States, and is now vested in the said citizens of your Orator owning, possessing and occupying the said lands.

In 1865 and the succeeding years, and as your Orator is credibly informed and believes long prior to the acts of the defendants hereinafter complained of, the occupation and settlement of the lands within the said water shed and drainage basin within Wyoming was begun, and continued in an increasing degree so that for many years prior to the commencement of said wrongful acts the lands

in Wyoming lying along the said Laramie River and its tributaries and in its drainage basin had been settled, cultivated, improved and rendered highly productive by the practice of irrigation and the use of the waters of the said Laramie River and its tributaries for the irrigation of the said lands, about twenty thousand people, citizens of Wyoming, being then and now settled and established and residing upon said lands along the said Laramie River and its tributaries in Wyoming, all of which population had thereby become and still is directly or indirectly dependent for its livelihood upon the continued flow and use of the said waters; and expenditures to the amount of about twenty million dollars had then been made and are now being continued and increased in the development of such waters and in reservoirs, canals and other appliances for the purpose of making beneficial use of the said waters as aforesaid; that a large part, to-wit, more than nine-tenths of the lands so settled upon, aggregating more than four hundred thousand acres of land, were patented by the United States to divers persons prior to the commencement of the wrongs hereinafter complained of, which said lands are now owned and possessed and occupied by citizens of your Orator. And the said waters are likewise used by the said citizens in the towns and villages along the said stream for domestic purposes in addition to their use for purposes of irrigation, as aforesaid. All of which appropriations and use of said waters were long prior to the commencement of the wrongs herein complained of.

Your Orator receives a large share of the moneys necessary for the purpose of governing, protecting and carrying on the business of your Orator and its citizens from the property and people of the said drainage basin in Wyoming, and without the said moneys so received would be greatly crippled in carrying out the proper business of your Orator as one of the States of the Union.

And your Orator is the proprietor of extensive and numerous tracts of land, to-wit, tracts of land aggregating more than fifty thousand acres, lying along the banks of the said Laramie River and its tributaries and within the said water shed or drainage basin, and within the State of Wyoming, title to which it acquired prior to the acts and threatened acts of defendants herein complained of, some of which lands are naturally watered in varying degrees by the waters of the said stream, and others of which have for many years been artificially irrigated by the use of said waters, and the value of all of the said lands of your Orator, as well as the value of all of the lands of its citizens within the said drainage basin, as aforesaid, depends almost wholly upon the continued use and enjoyment of the said waters.

Prior to the commencement of the wrongs herein complained of, your Orator had also established at the City of Laramie and near the margin of the said Laramie River, its State University, including among others the Agricultural College, the College of Mines, the State Normal School, the College of Liberal Arts, the Agricultural Experiment Station, at which the funds granted by the divers Acts of Congress to the State of Wyoming for experimental

research in agricultural and the mechanic arts are expended, employed and used, the successful and continued conduct of which institutions is largely dependent upon the use of the waters of the said River.

Prior to the commencement of the wrongs and threatened wrongs of the defendants as hereinafter set forth, as your Orator is credibly informed and verily believes, the defendant, The State of Colorado, and certain of its citizens had appropriated for the purpose of irrigating certain lands within the drainage basin and water shed of the said Laramie River in the State of Colorado, certain waters of the said River and its tributaries, but upon the like information and belief your Orator avers that the total amount of lands for which said appropriations were made in the State of Colorado did not and does not exceed three thousand acres of land, and the total amount of water that could reasonably or beneficially be used upon the said lands does not exceed six thousand acre feet of water per annum, an acre foot of water being such a flow of water as would, without deduction for seepage or evaporation, cover one acre of land to the depth of one foot in one year.

And your Orator further avers that the use of the said waters as so appropriated by the said defendant. The State of Colorado, and its citizens, was as your Orator is credibly informed and verily believes, at all times prior to the wrongs herein complained of, kept within the drainage basin of the said Laramie River, and that all the seepage and overflow from the irrigation of the said lands by the said State of Colorado and its citizens again returned to the said Laramie River for use of others within the said drainage area, including your Orator and its citizens, at points below the places of irrigation in the said State of Colorado. And upon like information and belief your Orator avers that owing to the character of the said drainage basin in the said State of Colorado and the character of the soil and its underlying strata at the places where the said irrigation in Colorado was accomplished a large proportion, to-wit, more than seventy-five per cent. of the waters so used within the said drainage basin in Colorado for irrigation actually returned to the said Laramie River and its tributaries before the said stream crossed into the State of Wyoming and above the points of diversion of said water by your Orator and its citizens, and above the points where the natural flow of the said waters of said Laramie River and its tributaries have immemorially been accustomed to flow upon and across the said lands of your Orator and its citizens.

And upon the like information and belief your Orator further avers that no other appropriation or use of the said waters of said Laramie River or its tributaries had been made by the said State of Colorado or its citizens or within the said State of Colorado prior to the appropriation of said waters by your Orator and its citizens as herein set forth, and no appropriation by said State of Colorado or its citizens had been made prior to the grants, patents and conveyances of the said lands by the United States under which your Orator and its citizens hold title to the lands herein alleged and

shown to be owned and possessed by your Orator and its citizens occupying the said lands.

And your Orator further avers that prior to the commencement of the wrongs or threatened wrongs hereinafter set forth, your Orator and its citizens within the area of the drainage basin of said Laramie River and its tributaries in the State of Wyoming had appropriated all of the available waters of the said Laramie River and its tributaries above the required flow thereof for riparian proprietors as herein set forth for the actual irrigation of the lands of your Orator and its citizens within the drainage basin and water shed of the said Laramie River, to-wit, for the irrigation of more than three hundred and twenty-five thousand acres of land within the said water shed and drainage basin, and had likewise enjoyed the waters of said stream and its tributaries for the sub-irrigation of more than twenty-five thousand acres of the lands riparian to said River and its tributaries so as aforesaid owned and possessed by your Orator and its citizens, and for watering large numbers of livestock and for domestic uses within the said water shed within the State of Wyoming.

And your Orator further avers that without the use of the said waters as aforesaid the lands of your Orator and its citizens within the said water shed within the State of Wyoming would be to a very large extent valueless and incapable of supporting any considerable population, and that with the use of the said waters as aforesaid, the said lands are very valuable, to-wit, of a value of more than ten million of dollars, and support a large population, to-wit, a population of more than twenty thousand people, and that the wrongs and threatened wrongs of the said defendants as hereinafter set forth if persisted in would render the lands of your Orator and its citizens in the said water shed and drainage basin to a very large extent valueless.

And your Orator well hoped that no disputes would have arisen touching the use of the said waters, or touching the rights of your Orator or its citizens in relation thereto, but that the said defendants and each of them would have complied with the reasonable requests of your Orator to permit said waters to be used in accordance with the rights of the parties as above set forth as in conscience and equity the said defendants, and each of them, ought to have done.

But now so it is, may it please your Honors, that the said defendants, The State of Colorado, The Greeley-Poudre Irrigation District, a municipal corporation, and The Laramie Poudre Reservoirs and Irrigation Company, a corporation, combining and confederating together and with divers persons at present unknown to your Orator, whose names when discovered your Orator prays it may be at liberty to insert herein, with apt words to charge them as parties defendant hereto, and contriving how to wrong and injure your Orator in the premises, threaten to take from the said Laramie River and its tributaries within the State of Colorado and to carry the same outside of the water shed of the said Laramie River for use in irrigation at points where the said waters cannot return to the said River, to-wit, at a distance of one hundred miles or more from the said water shed large volumes of the said waters, to-wit, more than one hundred



thousand acre feet per annum of the said waters, and that for the purpose of carrying out their said threats and purposes the said defendants have already begun the construction of a tunnel or tunnels through the walls of the said water shed and drainage basin of said River for the purpose of so as aforesaid diverting and carrying off the said waters, all of which has been done and is now being done and threatened contrary to the requests and protests of your Orator in the premises. The ditches and canals through which said defendants are now diverting said waters so far as at present known to your Orator are as follows, to-wit; Rawah or West Side Ditch gathering water from McIntyre, Rawah, Mill, Fall and Rapid Creeks, the said ditch being about six miles in length; the East Side Ditch gathering water from Dead Man, Nunn and Porter Creeks, the said ditch being about eight miles in length; said works having been commenced, as your Orator is informed and believes, on or about the first day of December, 1909.

And the said defendants absolutely refuse to comply with the said reasonable requests of your Orator to cease and refrain from the said diversion, at times pretending that they are merely changing the places of use of the waters appropriated within the State of Colorado for irrigation within the drainage basin of the said Laramie River as aforesaid, and at other times alleging and pretending that the State of Colorado is the full and absolute owner and entitled of right to dispose absolutely of all of the waters found within her borders regardless of the rights of your Orator and its citizens; and your Orator alleges and charges the contrary of the said claims and pretenses to be the truth, and that in truth and in fact the amount of water already diverted and taken away from the said drainage basin as aforesaid within the State of Colorado is itself largely in excess of any appropriations of water for the irrigation of lands in the State of Colorado within the drainage basin of the said Laramie River so far as such appropriations were made prior to the acquiring of the rights of your Orator and its citizens as aforesaid, and the amount so as aforesaid threatened to be diverted and carried away from the said drainage basin is also itself largely in excess of the quantity of water ever used for irrigation within the said drainage basin in the State of Colorado, and largely in excess of any amount of water that could be reasonably or beneficially used for the irrigation of any lands in said drainage basin in the State of Colorado, including all lands in said water shed that were ever irrigated from the waters of said stream or its tributaries, and also all of such lands that have not been irrigated, and the amount of water already taken added to the amount threatened to be taken as aforesaid is many times the amount of water that ever has been or could be reasonably or beneficially used upon the lands in Colorado within said drainage basin that were ever irrigated from the waters of said stream and its tributaries, or are irrigable therefrom.

And your Orator further avers that the diversion of the said waters from said drainage basin instead of using them upon lands within the said drainage basin deprives your Orator and its citizens of all the return flow and seepage of the said waters, which return flow and

seepage is very large in amount as above stated, and is of great value to and is necessary to your Orator and its citizens.

And your Orator further avers that in truth and in fact the said State of Colorado is not the owner of all or any of the waters within the said State with the full right to dispose of them as it may choose, but on the contrary that the rights of the said State of Colorado in reference to the disposition of the said waters were at all the times aforesaid, and now are subject to the rights acquired by your Orator and its citizens as aforesaid in said waters, nor have the defendants, or either of them, the right to so dispose of the said waters as to deprive your Orator or its citizens of the use thereof in accordance with their rights as aforesaid acquired by appropriation, or to deprive your Orator or its citizens of the waters so as aforesaid appropriated by them of the use of the said water in its accustomed channels for the sub-irrigation of the lands of your Orator and its citizens in the said drainage basin acquired as aforesaid, or to deprive the citizens of your Orator of the use of the said waters for watering their livestock or for domestic use.

All which actings, doings, and pretenses of the said defendants are contrary to equity and good conscience and tend to the manifest wrong, injury, and oppression of your Orator and its citizens in the premises. In consideration whereof, and for as much as your Orator is entirely remediless in the premises according to the strict rules of the Common Law, and can only have relief in a Court of Equity where matters of this nature are properly cognizable and relievable;

To the end, therefore, that the said defendants, The State of Colorado, The Greeley-Poudre Irrigation District, a municipal corporation, and The Laramie Poudre Reservoirs and Irrigation Company, a corporation, may, if they can, show why your Orator should not have the relief hereby prayed for, and may according to the best and utmost of their several and respective knowledge, remembrance, information, and belief, full, true, direct, and perfect answer make to all and singular the matters hereinbefore stated and charged as full and particularly as if the same were hereinafter repeated, and they were thereunto distinctly interrogated (but not under oath, answer under oath being hereby expressly waived).

May it please your Honors to grant unto your Orator the most gracious writ or writs of subpoena of the United States of America to be directed to the said defendants, The State of Colorado, The Greeley-Poudre Irrigation District, a municipal corporation, and The Laramie Poudre Reservoirs and Irrigation Company, a corporation, and the rest of their confederates when discovered, thereby commanding them and every one of them at a certain day and under a certain pain and penalty therein to be specified, personally to be and appear before your Honors in this Honorable Court and then and there to answer all and singular the premises (but not under oath, answer under oath being specially waived), and to stand to, perform, and abide such order and decree therein, as to your Honors shall seem meet.

And your Orator prays that the said defendants, and each of them,

**MAPS**

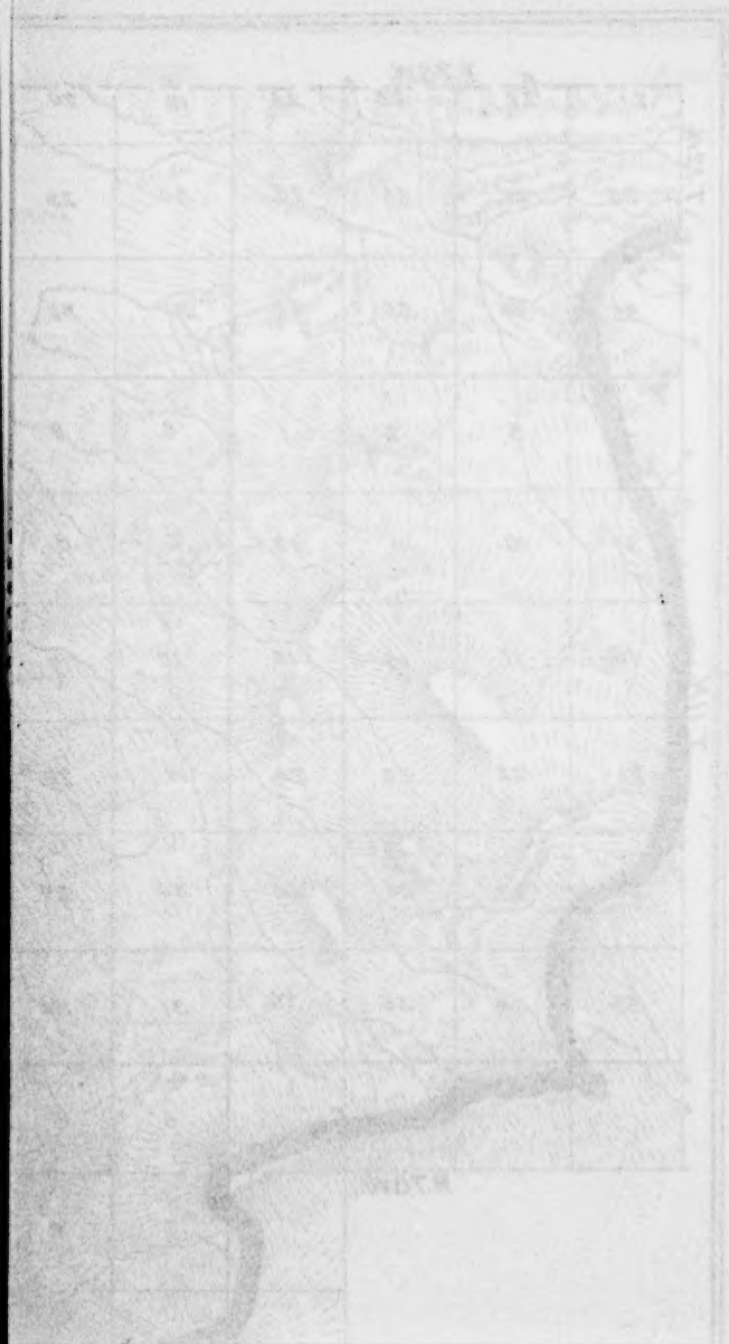
**TOO**

**LARGE**

**FOR**

**FILMING**





may be enjoined from diverting the said waters, or any of them, from the said water shed, and for all other proper relief, and your Orator will ever pray, etc.

DOUGLAS A. PRESTON,  
*Attorney General of the State of Wyoming and  
Solicitor and of Counsel for the Plaintiff.*

N. E. CORTHELL,  
JOHN W. LACEY,  
*Of Counsel.*

STATE OF WYOMING,  
*County of Laramie, ss:*

Douglas A. Preston, being duly sworn on his oath according to law, deposes and says, that he is the Attorney General of the State of Wyoming, and as such at the direction and upon the request of the Governor of said State exhibits the foregoing Bill of Complaint; that he has read the said Bill of Complaint, and that the facts therein set forth, save and excepting where averred on information and belief, are true, and that as to the facts therein alleged as upon information and belief affiant is credibly informed and verily believes that the said facts are true.

DOUGLAS A. PRESTON.

Subscribed in my presence and sworn to before me this 22nd day of May A. D. 1911.

[Seal of Jennie M. Tupper, Notary Public, Laramie County,  
Wyoming.]

JENNIE M. TUPPER, *Notary Public.*

(Here follow maps marked pages 27 and 27½.)

(Endorsed:) Supreme Court U. S., October Term, 1910. No. 20. Original. The State of Wyoming, Complainant, vs. The State of Colorado et al. Bill of Complaint. Filed May 29, 1911.

And on the same day, to wit, on the 29th day of May, A. D. 1911, an order for appearance for complainant was filed in words & figures following, viz:

*Order for Appearance,*

Supreme Court of the United States, October Term, 1910.

No. 20, Orig'l.

THE STATE OF WYOMING, Complainant,


vs.

THE STATE OF COLORADO et al.

The Clerk will enter my appearance as Counsel for the Complainant.

(Name) DOUGLAS A. PRESTON.

(P. O. Address:) Cheyenne, Wyoming.

 NOTE.—Must be signed by a member of the Bar of the Supreme Court United States. Individual and not firm names must be signed.

(Endorsed:) Supreme Court U. S., October Term, 1910. Term No. 20. Original. Appearance for Compl't. Filed May 29, 1911.

And afterwards, to wit, on the tenth day of June, A. D. 1911, a subpoena was issued.

And afterwards, to wit, on the 18th day of August, A. D. 1911, the subpoena and proof of service of same was filed in words & figures following, viz:

THE UNITED STATES OF AMERICA, ss:

The President of the United States to the State of Colorado, the Greeley-Poudre Irrigation District, a Municipal Corporation, and the Laramie Poudre Reservoirs and Irrigation Company, a Corporation, Greeting:

[SEAL.]

For certain causes offered before the Supreme Court of the United States, having jurisdiction in equity, you are hereby commanded that, laying all other matters aside and notwithstanding any excuse, you be and appear before the said Supreme Court, holding jurisdiction in equity, on the second Monday of October next, at the City

of Washington, in the District of Columbia, being the seat of the National Government of the United States, to answer unto a bill of complaint of the State of Wyoming in the said Court exhibited against you.

Hereof you are not to fail at your peril.

Witness the Honorable Edward D. White, Chief Justice of the United States, at the City of Washington, the tenth day of June, A. D. 1911.

JAMES H. MCKENNEY,

*Clerk of the Supreme Court of the United States.*

UNITED STATES OF AMERICA,

*District of Colorado, ss:*

I hereby certify and return that I have duly served the within Subpœna on the therein named The Greeley-Poudre Irrigation District, by handing to and leaving with C. E. Latham as the president thereof, a true and correct copy of the said writ, together with a copy of the bill of complaint, at Greeley, in said District, on July 3rd, A. D. 1911; As to the Laramie Poudre Reservoirs and Irrigation Company, by handing to and leaving with S. H. Shields, as secretary thereof, a true and correct copy of the said writ, together with a copy of the bill of complaint, at Denver, in said District, on July 5th A. D. 1911; As to The State of Colorado, by handing to and leaving with John F. Shafroth, as Governor thereof, a true and correct copy of said writ, together with a copy of the bill of complaint, at Denver, in said District, on July 7th, 1911.

This writ is therefore returned executed as the law directs, this 7th day of July, A. D. 1911.

D. C. BAILEY,

*United States Marshal,*

By E. G. JEFFERDS, *Deputy.*

Fees and costs: \$9.12.

Service of the within subpœna accepted:

BENJ. GRIFFITH,

*Attorney General, State of Colorado.*

Returned executed in full by service on defendants as evidenced by certificate endorsed hereon and by written acceptance of service on the part of the Attorney General of the State of Colorado.

Washington, August 15, 1911.

J. M. WRIGHT,

*Marshal Supreme Court U. S.*

(Endorsed:) Supreme Court U. S. October Term, 1911. Term No. 20, Original. The State of Wyoming, Complainant, vs. The State of Colorado et al. Subpœna and proof of service. Came to my hand at my office this 10th day of June, 1911, and for the purpose of executing this process. I hereby deputize and authorize Dewey C. Bailey, United States Marshal for the District of Colorado, on

any of his deputies indicated by him, to serve this subpoena on all or any one of the defendants herein and make due return thereof. Witness my hand this 10th day of June, 1911, at Washington City, D. C. J. M. Wright, Marshal Supreme Court of the United States. Filed August 18th, 1911.

And afterwards, towit, on the 9th day of October, A. D. 1911, orders for appearance for defendants were filed in words and figures following, viz:

*Order for Appearance.*

Supreme Court of the United States, October Term, 1911.

No. 9, Orig'l.

STATE OF WYOMING


vs.

STATE OF COLORADO et al.

The Clerk will enter my appearance as Counsel for the State of Colorado (one of the def'ts).

(Name) BENJAMIN GRIFFITH,  
*Attorney General of Colorado.*

(P. O. Address) State Capital, Denver, Colorado.

 NOTE.—Must be signed by a member of the Bar of the Supreme Court United States. Individual and not firm names must be signed.

(Endorsed:) Supreme Court U. S., October Term, 1911. Term No. 9. Orig'l. Appearance for def't, the State of Colorado. Filed Oct. 9, 1911.

*Order for Appearance.*

Supreme Court of the United States, October Term, 1911.

No. 9, Orig'l.

STATE OF WYOMING


vs.

STATE OF COLORADO et al.

The Clerk will enter my appearance as Counsel for *the* The Laramie Poudre Reservoirs & Irrigation Company (a def't).

(Name) CLYDE C. DAWSON.

(P. O. Address) Equitable Bld'g, Denver, Colorado.

 NOTE.—Must be signed by a member of the Bar of the Supreme Court United States. Individual and not firm names must be signed.

(Endorsed:) Supreme Court U. S., October Term, 1911. Term No. 9, Orig'l. Appearance for def't, The Laramie-Poudre Reservoirs & Irrigation Co. Filed Oct. 9, 1911.

*Order for Appearance.*

Supreme Court of the United States, October Term, 1911.

No. 9, Orig'l.

STATE OF WYOMING


vs.

STATE OF COLORADO et al.

The Clerk will enter my appearance as Counsel for The Laramie-Poudre Reservoirs & Irrigation Company (a def't).

(Name) CHARLES D. HAYT.

(P. O. Address) Equitable Building, Denver, Colorado.

 NOTE.—Must be signed by a member of the Bar of the Supreme Court United States. Individual and not firm names must be signed.

(Endorsed:) Supreme Court U. S., October Term, 1911. Term No. 9, Orig'l. Appearance for Def't, The Laramie Poudre Reservoirs & Irrigation Co. Filed Oct. 9, 1911.

*Order for Appearance.*

Supreme Court of the United States, October Term, 1911.

No. 9, Orig'l.

THE STATE OF WYOMING, Complainant,


vs.

THE STATE OF COLORADO et al.

The Clerk will enter my appearance as Counsel for The Laramie-Poudre Reservoirs and Irrigation Company (a def't).

(Name) JULIUS C. GUNTER.

(P. O. Address) 529-535 Equitable Building, Denver, Colorado.

 NOTE.—Must be signed by a member of the Bar of the Supreme Court United States. Individual and not firm names must be signed.

[Endorsed:] Supreme Court U. S. October Term, 1911. Term No. 9, Orig'l. Appearance for Def't, The Laramie-Poudre Reservoirs & Irrigation Co. Filed Oct. 9, 1911.

*Order for Appearance.*

Supreme Court of the United States, October Term, 1911.

No. 9, Orig'l.

THE STATE OF WYOMING


vs.

STATE OF COLORADO et al.

The Clerk will enter my appearance as Counsel for The Greeley-Poudre Irrigation District (a def't).

(Name) JULIUS C. GUNTER.

(P. O. Address) 529-535 Equitable Bldg., Denver, Colorado.

 NOTE.—Must be signed by a member of the Bar of the Supreme Court United States. Individual and not firm names must be signed.

[Endorsed:] Supreme Court U. S. October Term, 1911. Term No. 9, Orig'l. Appearance for Def't, The Greeley-Poudre Irrigation Dist. Filed Oct. 9, 1911.

And on the same day, to wit, October 9, A. D. 1911, a Stipulation to extend time for defendants to plead was filed in words & figures following, viz:

In the Supreme Court of the United States, October Term, 1910.

In Equity.

No. 9, Orig'l.

THE STATE OF WYOMING, Complainant,

vs.

THE STATE OF COLORADO, THE GREELEY-POUDRE IRRIGATION DISTRICT, a Municipal Corporation; The Laramie-Poudre Reservoirs and Irrigation Company, a Corporation, Defendants.

*Stipulation.*

Come now the parties above named, by their respective solicitors and counsel, and at the request of defendants who state that no sufficient time has elapsed since service, to prepare their pleadings and otherwise arrange their defense, stipulate and agree that the said defendants and each of them, may have the full period of ninety (90) days from and after the return day herein, to-wit: the

9th day of October, A. D. 1911, within which to plead to the bill of complaint as they, the said defendants may be advised.

D. A. PRESTON,  
*Attorney General, Wyoming;*

— — —  
*Solicitors and of Counsel for Complainant.*  
BENJAMIN GRIFFITH,  
*Attorney General, Solicitor and of Counsel.*  
*For the State of Colorado.*

CHARLES F. TEW,  
JULIUS C. GUNTER,  
*Solicitors and of Counsel for the*  
*Greeley-Poudre Irrigation District.*  
JULIUS C. GUNTER,  
*Solicitor and of Counsel for the Laramie-*  
*Poudre Reservoirs and Irrigation Company.*

Dated the 4th day of October, 1911.

Supreme Court U. S. October Term, 1911. Term No. 7 Original.  
The State of Wyoming, Complainant, vs. The State of Colorado  
et al., Stipulation to extend time for defendants to plead. Filed  
October 9, 1911. 190.

And on the same day, to wit, October 9, A. D. 1911, the following  
entry appears of record, viz:

No. 9, Orig'l.

THE STATE OF WYOMING, Complainant,  
vs.  
THE STATE OF COLORADO et al.

On motion of Mr. Julius C. Gunter of counsel for the defendants,  
It is now here ordered by the Court that the time to plead in this  
cause be extended for ninety days from this date.  
October 9, 1911.

And afterwards, to wit, on the 9th day of January, A. D. 1912, a  
notice of motion for leave to file Demurrer was filed in words &  
figures following, viz:



In the Supreme Court of the United States.

No. 9, Orig'l.

THE STATE OF WYOMING, Complainant,

vs.

THE STATE OF COLORADO, THE GREELEY-POUDRE IRRIGATION District, a Municipal Corporation, and The Laramie Poudre Reservoirs and Irrigation Company, a Corporation, Defendants.

*Notice.*

To the State of Wyoming, Complainant herein, and to the Honorable Douglas A. Preston, Attorney General of the said State and Solicitor for said Complainant:

You will please take notice that at the incoming of the Supreme Court of the United States, at 12:00 o'clock M., at the Capitol building in the City of Washington, District of Columbia, upon Monday, January 8th, 1912, or as soon thereafter as solicitors can be heard, the above named defendants will appear by their solicitors and present to said Court the joint demurrer of said defendants to the bill of complaint herein, and ask leave of Court to file the same; a copy of which demurrer is presented herewith: When and where you may be present if you so desire.

BENJ. GRIFFITH,

*Attorney General of the State of Colorado  
and Solicitor for said State.*

JULIUS C. GUNTER,

*Solicitors for the Greeley-Poudre  
Irrigation District, Defendant.*

JULIUS C. GUNTER,

CHARLES D. HAYT,

CLYDE C. DAWSON,

*Solicitors for the Laramie Poudre Reservoirs  
and Irrigation Company, Defendant.*

STATE OF WYOMING,

*County of Laramie, ss:*

Service of the above motion, by the delivery to me of a copy thereof, with a copy of the aforesaid demurrer, is hereby acknowledged this 3rd day of January, A. D. 1912.

D. A. PRESTON,

*Attorney General of the State of Wyoming  
and Solicitor for Complainant.*

(Endorsed:) Supreme Court U. S. October Term, 1911. Term No. 7, Original. The State of Wyoming, Complainant, vs. The State of Colorado et al. Notice of motion for leave to file demurrer and proof of service of same. Filed January 9, 1912.

And on the same day, to wit, the 9th day of January, A. D. 1912, the following entry appears of record, viz:

No. 9, Orig'l.

THE STATE OF WYOMING, Complainant,  
vs.  
THE STATE OF COLORADO et al.

On motion of Mr. Benjamin Griffith of counsel for the defendants, leave is hereby granted to file the demurrer of the defendants to the bill of complaint in this cause.

January 9, 1912.

And on the same day, to wit, on the 9th day of January, A. D. 1912, the demurrer was filed in words & figures following, viz:

In the Supreme Court of the United States.

In Equity.

No. 20, Original.

THE STATE OF WYOMING, Complainant,  
vs.  
THE STATE OF COLORADO, THE GREELEY-POUDRE IRRIGATION DISTRICT, a Municipal Corporation; The Laramie-Poudre Reservoirs and Irrigation Company, a Corporation, Defendants.

*Demurrer.*

To the Honorable the Judges of the Supreme Court of the United States:

The defendants, by protestation, not confessing or acknowledging all or any of the matters or things in the said bill of complaint contained to be true in such manner and form as the same are therein set forth and alleged, demur to the said bill, and for cause of demurrer show:

I.

That said bill of complaint is wholly without equity, in that it does not state or show any such cause as doth or ought to entitle complainant to the relief sought or prayed for against these defendants or against either thereof, or to any relief whatever.

Wherefore, and for divers other good causes for demurrer appearing on the face of said bill, these defendants demur thereto and pray the judgment of this Honorable Court whether they or either of them shall be compelled to make further or any answer to said bill;

and they humbly pray to be hence dismissed with their reasonable costs in this behalf sustained.

BENJ. GRIFFITH,  
*Attorney General of the State of Colorado, Defendant.*

JULIUS C. GUNTER,  
*Solicitors for the Greeley-Poudre Irrigation  
District, Defendant.*

JULIUS C. GUNTER,  
CHARLES D. HAYT,  
CLYDE C. DAWSON,  
*Solicitors for the Laramie-Poudre Reservoirs  
and Irrigation Company, Defendant.*

\_\_\_\_\_,  
\_\_\_\_\_,  
\_\_\_\_\_,  
\_\_\_\_\_,  
*Of Counsel.*

We hereby certify that we are solicitors and of counsel for each of the defendants above named, and that in our opinion the foregoing demurrer of said defendants respectively to the bill of complaint of the said State of Wyoming is well founded in point of law and proper to be filed in the above cause.

BENJ. GRIFFITH,  
JULIUS C. GUNTER,  
CHARLES D. HAYT,  
CLYDE C. DAWSON,  
*Solicitors and of Counsel for Defendants Above Named.*

UNITED STATES OF AMERICA,  
*District of Colorado, ss:*

Benjamin Griffith, being duly sworn, deposes and says that he is the Attorney General of the State of Colorado, one of the defendants named in the foregoing demurrer, and is authorized to verify the same on behalf of said defendant and the other defendants named, and that the foregoing demurrer is not interposed to delay the cause or any proceeding therein.

BENJAMIN GRIFFITH.

Subscribed and sworn to before me this 28th day of December, A. D. 1911.

My commission expires December 13, 1914.

[Seal John B. Betts, Notary Public, City and County of Denver,  
Colorado.]

JOHN B. BETTS,  
*Notary Public.*

(Endorsed:) Supreme Court U. S. October Term, 1911. No. 9,  
Original. The State of Wyoming, Complainant, v. The State of  
Colorado et al. Demurrer. Filed January 9, 1912.

And afterwards, to wit, on the 24 day of January, A. D. 1912, an order for appearance was filed in words and figures following, viz:

*Order for Appearance.*

Supreme Court of the United States, October Term, 1911.

No. 9, Orig'l.

THE STATE OF WYOMING, Complainant,


vs.

THE STATE OF COLORADO et al.

The Clerk will enter my appearance as Counsel for the State of Colorado and Greeley-Poudre Irrigation District.

(Name) CHARLES F. TEW.

(P. O. Address) Greeley, Colorado.

 NOTE.—Must be signed by a member of the Bar of the Supreme Court United States. Individual and not firm names must be signed.

(Endorsed:) Supreme Court U. S., October Term, 1911. Term No. 9, Original. Appearance for Colorado & Greeley Poudre Irrigation Dist. Filed Jan. 24, 1912.

And afterwards, to wit, on the 5th day of March, A. D. 1912, a motion to set demurrer for hearing was filed in words and figures following, viz:

In the Supreme Court of the United States.

In Equity.

No. 20, Original.

THE STATE OF WYOMING, Complainant,

vs.

THE STATE OF COLORADO, THE GREELEY POUDE IRRIGATION DISTRICT, a Municipal Corporation, The Laramie Poudre Reservoirs and Irrigation Company, a Corporation, Defendants.

Comes now the Complainant in said cause, by Douglas A. Preston, Attorney General for the State of Wyoming and solicitor and of counsel for the Complainant and prays the Court to set down for argument, at some convenient date, the demurrer in said cause to the Bill of Complaint.

DOUGLAS A. PRESTON,

*Attorney General of the State of Wyoming  
and Solicitor and of Counsel for the Plaintiff.*

In the Supreme Court of the United States.

In Equity.

No. 20, Original.

THE STATE OF WYOMING, Complainant,

VS.

THE STATE OF COLORADO, THE GREELEY-POUDRE IRRIGATION DISTRICT, a Corporation, The Laramie Poudre Reservoirs and Irrigation Company, a Corporation, Defendants.

*Notice.*

To the State of Colorado, The Greeley Poudre Irrigation District and The Laramie Poudre Reservoirs and Irrigation Company, Defendants:

You will please take notice that at the incoming of the Supreme Court of the United States at twelve o'clock M., at the Capitol Building, March 4, 1912, or as soon thereafter as solicitors can be heard, the above named Complainant will appear by its solicitors and present to said Court an application to have set for hearing the Demurrer of the Defendants heretofore filed to the Bill of Complaint herein: Where and where you may be present if you so desire. A copy of which application is presented herewith.

DOUGLAS A. PRESTON,  
*Attorney General of the State of Wyoming  
and Solicitor and of Counsel for the Plaintiff.*

STATE OF COLORADO,  
*County of Denver, ss:*

Service of the foregoing notice, by the delivery to me of a copy thereof with a copy of the foregoing application to set down for argument the Demurrer to the Bill of Complaint, is hereby acknowledged, this 23d day of February, A. D. 1912.

BENJAMIN GRIFFITH,  
*Attorney General of the State of Colorado  
and Solicitor for said State, Defendant.*

CHARLES F. TEW,  
*Solicitor for the Greeley Poudre  
Irrigation District, Defendant.*

JULIUS C. GUNTER,  
CHARLES D. HAYT,  
CLYDE C. DAWSON,  
*Solicitor for the Laramie Poudre Reservoirs  
and Irrigation Company, Defendant.*

(Endorsed:) Supreme Court of the U. S. October Term, 1911. Term No. 7, Original. The State of Wyoming, Complainant, vs. The State of Colorado et al. Motion to set demurrer for hearing, notice and proof of service. Filed March 5, 1912.

And on the same day, to wit, on the 5th day of March, A. D. 1912, the following entry appears of record, viz:

No. 9, Orig'l.

THE STATE OF WYOMING, Complainant,

vs.

THE STATE OF COLORADO et al.

On motion of Mr. Douglas A. Preston of counsel for the complainant,

It is now here ordered by the Court that the demurrer in this cause be, and the same is hereby, assigned for hearing on Tuesday, October 15th next.

March 5, 1912.

And afterwards, to wit, on the 15th day of October, A. D. 1912, the following entry appears of record, viz:

8, Original.

STATE OF WYOMING, Complainant,

vs.

THE STATE OF COLORADO et al.

The argument of the demurrer in this cause was commenced by Mr. C. D. Hayt, of counsel for the defendants in support of the demurrer; continued by Mr. Benjamin Griffith, of counsel for the defendants in support of the demurrer and by Mr. John W. Lacey, of counsel for the complainant, in opposition to the demurrer, and concluded by Mr. Julius C. Gunter, of counsel for the defendants, in support of the demurrer.

October 15, 1912.

And on the same day, to wit, the 15th day of October, A. D. 1912, and order for appearance was filed in words & figures following, to wit:

*Order for Appearance.*


Supreme Court of the United States, October Term, 1912.

No. 8, Orig'l.

THE STATE OF WYOMING  
vs.  
THE STATE OF COLORADO et al.

The clerk will enter my appearance as Counsel for the State of Wyoming, Compl't.

(Name) JOHN W. LACEY,  
(P. O. Address) Cheyenne, Wyo.

 NOTE.—Must be signed by a member of the Bar of the Supreme Court United States. Individual and not firm names must be signed.

(Endorsed:) Supreme Court U. S. October Term, 1912. Term No. 8, Orig'l. Appearance for Compl't. Filed Oct. 15, 1912.

And afterwards, to wit, on the 21st day of October A. D. 1912, the following entry appears of record, viz:

8, Original.

THE STATE OF WYOMING, Complainant,  
vs.  
THE STATE OF COLORADO et al.

This cause came on to be heard on the demurrer of the defendants to the bill of complaint herein, and was argued by counsel.

On consideration whereof, It is now here ordered by the Court that the said demurrer be, and the same is hereby, overruled without prejudice to any question, and leave is hereby granted the defendants to file answer herein within ninety days.

October 21, 1912.

And afterwards, to wit, on the 7th day of January, A. D. 1913, an order for appearance was filed in words & figures following, viz:

*Order for Appearance.*


Supreme Court of the United States, October Term, 1912.

No. 8, Orig'l.

THE STATE OF WYOMING, Compl't,  
vs.  
THE STATE OF COLORADO et al.

The Clerk will enter my appearance as Counsel for the State of Colorado.

(Name) FRED FARRAR,  
(P. O. Address) Capitol Bldg., Denver, Colo.

 NOTE.—Must be signed by a member of the Bar of the Supreme Court United States. Individual and not firm names must be signed.

[Endorsed:] Supreme Court U. S. October Term, 1912. Term No. 8, Orig'l. Appearance for defendant the State of Colorado. Filed Jan. 7, 1913.

And afterwards, to wit, on the 8th day of January, A. D. 1913, the following entry appears of record, viz:

8, Original.

THE STATE OF WYOMING, Complainant,  
vs.  
THE STATE OF COLORADO et al.

On motion of Mr. Fred Farrar of counsel for the defendant, The State of Colorado, leave is hereby granted to file answers in this cause.

January 8, 1913.

And on the same day, to wit, on the 8th day of January, A. D. 1913, an order for appearance was filed in words & figures following, viz.:



*Order for Appearance.*


Supreme Court of the United States, October Term, 1912.

No. 8, Orig'l.

THE STATE OF WYOMING, Compl't,  
vs.  
THE STATE OF COLORADO et al.

The Clerk will enter my appearance as Counsel for the Greeley-Poudre Irrigation District, one of the defendants.

(Name) DELPH E. CARPENTER,  
(P. O. Address) Greeley, Colorado.

 NOTE.—Must be signed by a member of the Bar of the Supreme Court United States. Individual and not firm names must be signed.

[Endorsed:] Supreme Court U. S. October Term, 1912. Term No. 8, Orig'l. Appearance for defendant The Greeley-Poudre Irrigation Dist. Filed Jan. 8, 1913.

And on the same day, to wit, the 8th day of January, A. D. 1913, the answers of defendants were filed in words and figures following, viz:

In the Supreme Court of the United States.

In Equity.

No. 8, Original.

THE STATE OF WYOMING, Complainant,  
vs.  
THE STATE OF COLORADO, THE GREELEY-POUDRE IRRIGATION DISTRICT, a Municipal Corporation; The Laramie-Poudre Reservoirs and Irrigation Company, a Corporation, Defendants.

*Answer of the State of Colorado.*

This defendant, the State of Colorado, now and at all times hereinafter saving to itself all and all manner of benefit or advantage of exception or otherwise that can or may be had or taken to the many errors, uncertainties and imperfections in the said bill of complaint contained, for its answer thereto, or to so much thereof as it is advised it is material and necessary for them to answer to, saith:

**I.**

Admits that the greater extent of the drainage basin of the Laramie River in Colorado is in a mountainous and heavily timbered

country, where snows fall in winter, but denies that the run-off from said drainage basin supplies all of the waters flowing in the channel of the Laramie River and its tributaries. Defendant avers that less than one-half of the run-off of the Laramie River is supplied by the drainage basin of the Laramie River and its tributaries within the State of Colorado. Defendant avers that among the tributaries of the Laramie River rising in the mountainous regions of Colorado and discharging their waters into the Laramie River, in addition to those enumerated in the bill of complaint, are Johnson Creek and Beaver Creek. Defendant denies that Complainant's Exhibit A shows either the drainage basin of the Laramie River and its tributaries, or the irrigated lands thereunder, within the State of Wyoming, and avers that the map attached to the joint and several answer of the Greeley-Poudre Irrigation District and The Laramie-Poudre Reservoirs and Irrigation Company, marked Exhibit I and made a part of this answer, shows the drainage basin of the Laramie River and its tributaries, and the irrigation ditches and works taking water therefrom, within the State of Wyoming, but avers that only about 25,000 acres of the lands designated on Exhibit I as irrigated lands were under irrigation at the time of the inception of the defendants. The Laramie-Poudre Reservoirs and Irrigation Company's rights to divert water through the tunnel mentioned in the bill of complaint, and which diversion is sought to be enjoined herein. Defendant denies that the map marked Exhibit B, attached to the bill of complaint, is a correct map of the drainage basin of the said river and its tributaries within the State of Colorado, and avers that Exhibit I, heretofore mentioned, and made a part of this answer, is a true map of the last-mentioned drainage basin. Defendant admits that the larger part of the watershed of said river and its tributaries in Colorado is mountainous, rocky, and timbered, and avers that a large portion of the 3,865 square miles of the drainage area of said river and its tributaries in Wyoming is also mountainous, rocky, and timbered, upon which the precipitation of moisture is great, and from which the run-off is about 500,000 acre-feet annually. Defendant avers that a considerable part of the run-off from the drainage area of said river and its tributaries within Colorado enters the Laramie River after it enters the State of Wyoming. Defendant avers that about 4,000 acres of the drainage basin of said Laramie River and its tributaries within Colorado are of irrigable character. Defendant denies that the greater portion of the drainage area of said river and its tributaries in Wyoming is irrigable and productive, and avers that not to exceed 100,000 acres of the drainage area of the said river and its tributaries within the State of Wyoming are productive under irrigation; that of this area about 50,000 acres lie in said drainage area between the Colorado line and the Wheatland Reservoir, as shown on Defendant's Exhibit I, which last-mentioned area is located at a high altitude—to wit, about 7,500 feet—where the irrigation season is short—to wit, about six weeks—commencing about the fifteenth of June, and the lands of which are of inferior quality, unproductive, adapted to raising only limited crops. Defendant further avers that the remaining portion of the

lands in the drainage basin of said river and its tributaries, lying in the vicinity of Wheatland, aggregate about 50,000 acres. This land has some productivity, but the greater part of the irrigation rights therefor were initiated long after the inception of the rights through which these defendants make claim to divert a part of the waters of said river and its tributaries, through the tunnel mentioned in the bill of complaint. Defendant admits that prior to the act of Congress of July 25, 1868, creating the Territory of Wyoming, that portion of the watershed and drainage basin of the Laramie River and its tributaries which is now within the State of Wyoming was within the boundaries and subject to the laws of the Territory of Dakota; but denies that at any time the riparian proprietors on said stream had the right to have the waters of said stream or its tributaries flow across or along their lands unpolluted and undiminished. Defendant avers at no time did the doctrine of riparian ownership of waters obtain in that part of Dakota Territory, since said act of Congress a part of the State of Wyoming. Defendant avers that at no time has it been the law that diversions of water from said stream or its tributaries in Wyoming, or diversions therefrom made in Colorado for application in Wyoming, could be made to the prejudice of the rights of the State of Colorado in the exercise of her inherent sovereign power to divert from the section of the Laramie River within Colorado the entire run-off of said section for use within the State of Colorado. Defendant avers that change in the point of diversion, the place of use, and the kind of use, where the same is made from the section of the stream within Colorado, may at any time be made within the State of Colorado, provided the same can be done without prejudice to any existing appropriations within the State of Colorado. Defendant further avers that the waters of said stream and its tributaries within the State of Colorado constitute a part of the natural resources of, and were and are owned by, the State of Colorado, subject to the right of appropriations thereof under her laws. Defendant avers that the right of appropriation and use of the waters of said stream and its tributaries within Colorado is to no extent affected by, or subject to, the laws of any other sovereignty than that of the State of Colorado. As to whether or not the United States of America in 1862, or at any other time, granted to the Union Pacific Railway Company 350,000 acres of land, or any part thereof, within the State of Wyoming, riparian to the Laramie River and its tributaries, this defendant has not and cannot obtain sufficient knowledge or information upon which to base a belief. As to whether or not the last-mentioned lands, or any part thereof, have passed from said railroad company, or are at this time owned or possessed by 1,500 or any other number of people, this defendant has not and cannot obtain sufficient knowledge or information upon which to base a belief. This defendant denies that the right to the continuous flow of the waters of said river, or any part thereof, or any of the waters of its tributaries, is vested in the citizens of complainant; denies that the doctrine of continuous flow or of riparian rights at any time obtained in the drainage basin of the Laramie River and its tributaries within the State of Wyoming; admits that, prior to the com-

mencement of construction of the system of irrigation having for its purpose the diversion by the defendants of a part of the waters of the Laramie River and its tributaries, some of the lands lying along said river and its tributaries had been settled and improved, and that some part thereof had been rendered more productive by irrigation from said stream and its tributaries, but avers that the run-off of said river and its tributaries was ample to supply the demands and rights so created, and leave an abundance of water to supply the diversions sought to be enjoined herein. Defendant denies that the lands of said area without the use of water, the diversion of which is sought to be enjoined herein, would be rendered valueless, and also denies that 20,000 people, or any number in excess of 2,000, residing upon said lands, are supported, directly or indirectly, by reason of the irrigation and cultivation of said lands; denies that \$20,000,000, or any sum in excess of \$500,000, had been expended within the State of Wyoming in the development or use of the waters of said stream or its tributaries, prior to the initiation of the rights of the defendant, the Laramie-Poudre Reservoirs and Irrigation Company. As to whether or not 400,000 acres of land lying in the drainage basin of said river and its tributaries within the State of Wyoming had been patented by the United States of America prior to the commencement of construction of its said system of irrigation by defendant, the Laramie-Poudre Reservoirs and Irrigation Company, this defendant has not and cannot obtain sufficient knowledge or information upon which to base a belief. As to what number of acres of the last-mentioned land are now owned, possessed, or occupied by citizens of complainant, defendant has not and cannot obtain sufficient knowledge or information upon which to base a belief. Defendant admits that certain of the waters of said river and its tributaries are used by citizens of towns and villages in Wyoming, but avers that there is more than sufficient run-off in said stream and its tributaries to satisfy such needs and to supply the rights of the defendants sought to be enjoined in this suit; admits the existence of certain appropriations from said river and its tributaries prior to the commencement of construction of the defendant's system of irrigation, mentioned in the bill of complaint, but avers that the run-off of said stream and its tributaries was and is more than sufficient to satisfy the same and the diversions sought to be enjoined in this action. As to whether or not complainant is the proprietor of 50,000 acres of land within said watershed, this defendant has not and cannot obtain sufficient knowledge or information upon which to base a belief. Defendant admits that prior to the commencement of construction of the irrigation system for the purpose of the diversions, sought to be enjoined herein, certain citizens of the State of Colorado had appropriated, for the purpose of irrigating certain lands within said drainage basin, certain waters of said river and its tributaries, and avers that such appropriations amounted to about 8,000 acre-feet of water per annum. As to what part of said waters, applied within the drainage basin of Colorado, has heretofore returned to the stream and its tributaries, this defendant has not and cannot obtain sufficient knowledge or informa-

tion upon which to base a belief. Defendant avers that other appropriations of said waters of said Laramie River and its tributaries had been made by the State of Colorado and its citizens within the State of Colorado, prior to the appropriations of said waters by complainant and its citizens, as set forth in the complaint, and avers that on the 25th day of August, 1902, the defendant The Laramie-Poudre Reservoirs and Irrigation Company, and its predecessors in title, by commencement of construction, initiated its rights to the diversion, for the purpose of irrigation and domestic use, through the tunnel mentioned in the bill of complaint, to 1235 second-feet of water, and that at the time of the initiation of such rights of the defendant The Laramie-Poudre Reservoirs and Irrigation Company and its predecessors in title, there was abundant water in the said stream to satisfy all prior appropriations then in existence in the State of Colorado and in the State of Wyoming. Defendant denies that, prior to the threatened diversion sought to be enjoined in the complaint, the plaintiff and its citizens had appropriated all of the available waters of the said Laramie River and its tributaries, but avers that at such time there was ample run-off in said stream, and that there is now ample water therein, to supply the threatened diversions of these defendants and all prior rights in the State of Wyoming. Defendant avers that at no time prior to the institution of this suit had more than 50,000 acre-feet annually been taken from said stream and its tributaries for use in the State of Wyoming. Defendant avers at the time of the initiation of the rights, the exercise of which is sought to be enjoined in this suit, rights for the appropriation of water for irrigation and domestic use in the State of Wyoming had been created or initiated for not exceeding 50,000 acre-feet, and avers that at such time there was available to supply such last-mentioned rights or initiated rights more than 800,000 acre-feet annually in the run-off of said stream. As to whether or not the plaintiff had, and its citizens had, at any time employed the waters of said stream and its said tributaries, for the subirrigation of 25,000 acres of land riparian to said stream and its said tributaries, said land being owned and possessed by said complainant and its citizens, and for live-stock and domestic uses, this defendant has not and cannot obtain sufficient knowledge or information upon which to base a belief. Defendant denies that the waters sought to be diverted through the tunnel mentioned in the bill of complaint would render the lands lying within the basin of said stream and its tributaries, within the State of Wyoming, to a large extent valueless and unable to support any considerable population; denies that the use of the waters so sought to be enjoined would add the value of \$10,000,000 to the lands within said watershed within the State of Wyoming, or would enable said land to support a population of 20,000 people, or any other considerable number of people; denies that the diversion sought to be enjoined herein would render the lands in the water-shed of said stream and its tributaries within Wyoming valueless. Defendant denies that it and its co-defendants are threatening to divert, by the tunnel mentioned in the bill of complaint, or otherwise, more than 100,000 acre-feet per annum of the

waters of said stream and its tributaries, and avers that the maximum diversion which can be made through said tunnel, or the irrigation system in aid thereof, does not and cannot exceed 70,000 acre-feet annually from the run-off of said stream, which run-off amounts to about 800,000 acre-feet annually. Defendant denies that there has been diverted in any manner within the State of Colorado, for application to a beneficial use within the drainage basin of said river and its tributaries, a larger amount of water than was necessary to the appropriations made prior to the acquired rights of complainant and its citizens. Defendant avers that at no time has a greater amount of water been diverted from said stream for application to a beneficial use within the State of Colorado than the appropriations within the State of Colorado called for, and that at such time there was ample water in said stream to satisfy such appropriations and all prior appropriations within the State of Wyoming. Defendant avers that the State of Colorado is the owner of all waters within said State of Colorado, with the full right to dispose of them as it may choose, and denies that such rights are subject to the rights acquired by the complainant and its citizens, as alleged in the bill of complaint; avers that it is the right of the defendant commonwealth to dispose of the waters of that portion of said stream lying within the State of Colorado, without let or hindrance by the complainant or its citizens; and defendant avers that the defendant commonwealth can so dispose of the waters of said stream regardless of the prejudice that it may work to the complainant or its citizens within the State of Wyoming, and need give no reason for its will.

## II.

Further answering said bill of complaint, this defendant, the State of Colorado, alleges that on the first day of August, 1876, it was admitted into the Union, and then became, and ever since said date has been, and now is, a sovereign state; that within the boundaries of its own territory it possesses the full rights and prerogatives of sovereignty, save as to that portion of power delegated to the federal government by the Constitution of the United States; and that this defendant, the said State of Colorado, is foreign to the State of Wyoming for all but federal purposes; that, being so sovereign within its own territory, it has the plenary and exclusive right and power to control and regulate the use of non-navigable waters within its boundaries, including non-navigable rivers and other streams, and that it has never surrendered this sovereign power over water rights and streams, nor delegated this power, or any portion thereof, to any other sovereign, either national or state.

Defendant further alleges that the territory of the State of Colorado is the apex of the Continental Divide, dividing the waters flowing into the Atlantic and the Pacific, and that streams originating in the mountain heights within the State of Colorado flow in every direction out of the state; that the original of these streams is generally near the center of the state, and at no place within the state do any of these streams attain any considerable size in comparison with



rivers in the less arid sections of the country; that, owing to the topographical nature of the territory within the State of Colorado, these streams, as a rule, and particularly upon the eastern slope of the Rocky Mountains, after leaving the mountains in which they originate, flow across lands of a nature usually described as plains, and from which, owing to the lack of rainfall, these streams receive no additional supply of water, but, on the contrary, the water in said streams is very rapidly diminished by evaporation and by absorption by the soil through which they pass; that these lands have a soil of unusual fertility, and when irrigated produce crops unexcelled and almost unequalled in quantity and quality.

This defendant alleges that the Laramie River, named in the complainant's bill of complaint, is a stream having its sources within the boundaries of the State of Colorado and flowing within said state for a distance of twenty-seven miles, until it crosses the northern boundary thereof and enters the State of Wyoming; that said river is not navigable within either the State of Colorado or the State of Wyoming, and that the same is not an avenue or instrumentality of interstate commerce as between the States of Colorado and Wyoming. The use of the waters of said stream by diversion thereof, and application of the same upon lands within the territorial limits of the State of Colorado, is essential to the life and well-being of the inhabitants of a large area within Colorado, and the right of continued use of the said waters is as vital to the inhabitants of the lands upon which said waters are to be applied as is the land itself. This defendant alleges that the jurisdiction and rights of the State of Wyoming, either in its sovereign capacity or as a proprietor of lands, and the rights of the citizens of Wyoming, do not extend into the State of Colorado, and this defendant further alleges that, under the laws and principles of international and interstate law, the sovereign rights of this defendant over the waters of the section of the Laramie River and its tributaries lying within the State of Colorado are not subservient to the sovereignty or rights of the State of Wyoming, and that the State of Wyoming has no dominant estate, rights, or jurisdiction as against this defendant, or its people, in that part of the Laramie River and its tributaries flowing in the State of Colorado, and that the State of Colorado cannot be subjected to the burden of arresting its development, or of denying to its inhabitants the use of an element which nature has supplied entirely within its own territory, and without which, and the free use thereof, the lands to which said water is sought to be applied would be uninhabitable.

### III.

This defendant, further answering the bill of complaint, says that the Laramie River and certain of its tributaries rise within the State of Colorado; that the drainage area thereof within the State of Colorado is about 428 square miles, and that the length of the said stream in Colorado is about twenty-seven miles; that the drainage area of said stream and its tributaries within the State of Wyoming is 3,865 square miles, and that the total drainage area of said stream



within the States of Colorado and Wyoming is 4,293 square miles, and that the length of said stream within Wyoming is about 150 miles; that the annual run-off of the sections of said stream lying within the State of Colorado is about 300,000 acre-feet, and that the annual run-off of the sections of said stream lying within the State of Wyoming is about 500,000 acre-feet; that the diversion system, the operation of which is sought to be enjoined herein, taps only the upper sections of said stream and its tributaries lying within the State of Colorado, and only about seventy-five square miles of the said drainage area of 428 square miles lying within Colorado. Further, that said diversion system sought to be enjoined herein cannot divert annually more than 70,000 acre-feet of the annual run-off of 800,000 acre-feet of said stream and its tributaries. Further, that by reason of natural conditions, there cannot be diverted from said stream for said use within the State of Colorado more than 90,000 acre-feet annually. Defendant further alleges that said stream and its tributaries rise in the mountains of Colorado, at an altitude of from about 8,000 to 14,000 feet, that its waters flow through a deep valley and mountain canyons within Colorado, and thence along the same into the section of the stream lying within the State of Wyoming; that the bed of said stream within Colorado is so low that water can only be diverted from the upper sections of said stream and its tributaries for use in Colorado; and defendant alleges that, under and by the system the operation of which is sought to be enjoined herein, and all other practicable means, no more than 90,000 acre-feet annually can be diverted from said stream and its tributaries for use upon lands lying within the State of Colorado.

Defendant avers that long prior to the institution of the present suit, and at a time when all of the diversion from said stream and its tributaries for use within the State of Wyoming did not exceed 50,000 acre-feet, citizens of this defendant and predecessors in title to the co-defendants of this defendant, acting under the authority and by the permission of this defendant, the State of Colorado, diverted from said stream about 8,000 acre-feet annually, and applied the same to irrigation and domestic uses within the watershed of said stream. Defendant further avers that on, to-wit, August 25, 1902, the predecessors in interest of the co-defendants of this defendant conceived an extensive system of irrigation for the conveyance of about 70,000 acre-feet of the run-off of the upper reaches of the said stream to a body of 125,000 acres of rich land, lying in the valley of the Cache la Poudre River in the County of Weld, State of Colorado, and necessary for the reclamation of said body of land; that, in pursuance thereof, and in accordance with the laws of this defendant and by its permission, irrigation rights for said system were initiated by the predecessors in interest of the co-defendants of this defendant, on August 25, 1902, by the commencement of actual construction on said system; and since the last-mentioned date, in further pursuance of said undertaking, a collection system for gathering the upper water of said river and its tributaries, a reservoir for impounding the same, and a tunnel of about 12,000 feet in length for

the carriage of the same through the mountain range constituting the eastern boundary of the watershed of said river and its tributaries, have all been constructed and are now practically completed, at a cost of about \$1,200,000. Defendant further avers that, in addition to said expenditure and construction, water rights and other interests, including reservoir sites, have been purchased, and construction work done thereon, at a further cost of about \$1,500,000. Defendant avers that said system is practical and will with due diligence be completed. Defendant avers that, in aid of said irrigation system, an irrigation district, the defendant The Greeley-Poudre Irrigation District, a municipal corporation, was formed under the laws of the State of Colorado, embracing about 125,000 acres of land; that bonds for said purpose were voted and issued to the amount of \$5,100,000 par value, and made a first lien on the lands of said district, and that a total of about \$2,700,000 of said bonds, par value, have been expended in the purchase of water rights and in the construction of said irrigation system. Defendant further avers that about \$2,300,000 of said bonds are in the treasury of said district, and are available for the completion of said system.

Defendant avers that, relying upon the diversion of said 70,000 acre-feet annually from said Laramie River and its tributaries, citizens of this defendant have filed upon large bodies of public lands in said district under the homestead and desert land laws of the United States, and have placed valuable improvements thereon, and are preparing at great expense to make homes thereon; that large bodies of other land in said district have been purchased relying on said diversion from the Laramie River, and valuable improvements have been made on the same; that if the said diversion from the Laramie River is permitted, it will enhance the value of said land about \$50,000,000; if denied, it will largely destroy the value of said lands, and will defeat the acquisition of title to all of said lands filed upon under the desert land laws of the United States. Defendant further avers that at the time of the initiation of the irrigation rights, the exercise of which is sought to be enjoined in this proceeding, there was, and after this proposed diversion is made will be, abundant water left in the Laramie River and its tributaries to supply all the irrigation rights in the State of Wyoming which had their origin prior to the inception of the rights, the exercise of which is sought to be enjoined herein. The defendant further avers that the lands within the State of Wyoming, to the irrigation of which the water of the Laramie River and its tributaries has been applied and can be applied, are greatly inferior in productiveness to the lands within the State of Colorado to which the waters herein involved will be applied; and, further, that the lands within the State of Wyoming, in addition to being non-productive, require a greatly increased quantity of water over the necessities of the lands in the State of Colorado for their irrigation; and, further, that the application of water thereto—that is, to the lands within the State of Wyoming—will produce less returns.

This defendant, having now fully answered all the allegations in plaintiff's bill of complaint, or so much thereof as the defendant is

advised ought to be answered, asks to be hence dismissed with costs and charges in this behalf sustained.

BENJ. GRIFFITH,  
*Attorney-General of Colorado and*  
*Solicitor for Defendant.*

FRED FARRAR,  
*Of Counsel.*

(Endorsed:) Supreme Court U. S. October Term, 1912. No. 8, Original. The State of Wyoming, Complainant, vs. The State of Colorado et al. Answer of Defendant, The State of Colorado. Filed January 8, 1913.

In the Supreme Court of the United States.

In Equity.

No. 8, Original.

THE STATE OF WYOMING, Complainant,  
vs.

THE STATE OF COLORADO, THE GREELEY-POUDRE IRRIGATION DISTRICT, a Municipal Corporation; The Laramie-Poudre Reservoirs and Irrigation Company, a Corporation, Defendants.

*Joint and Several Answer of the Defendants, the Laramie-Poudre Reservoirs and Irrigation Company and the Greeley-Poudre Irrigation District, to the Bill of Complaint of the State of Wyoming, Complainant.*

These defendants, The Laramie-Poudre Reservoirs and Irrigation Company and The Greeley-Poudre Irrigation District, and each of them, now and at all times hereinafter saving to themselves all and all manner of benefit or advantage of exception or otherwise that can or may be had or taken to the many errors, uncertainties, and imperfections in the said bill of complaint contained, for their joint and several answer thereto, or to so much thereof as they are advised it is material and necessary for them to answer to, severally answering, saith:

I.

Admit that the greater extent of the drainage basin of the Laramie River in Colorado is in a mountainous and heavily timbered country, where snows fall in winter, but deny that the run-off from said drainage basin supplies all of the waters flowing in the channel of the Laramie River and its tributaries. Defendants aver that less than one-half of the run-off of the Laramie River is supplied by the drainage basin of the Laramie River and its tributaries within the State of Colorado. Defendants aver that among the tributaries of the Laramie River rising in the mountainous regions of Colorado

and discharging their waters into the Laramie River, in addition to those enumerated in the bill of complaint, are Johnson Creek and Beaver Creek. Defendants deny that Exhibit A shows either the drainage basin of the Laramie River and its tributaries, or the irrigated lands thereunder, within the State of Wyoming; and aver that the map hereto attached, marked Exhibit I and made a part of this answer, shows the drainage basin of the Laramie River and its tributaries, and the irrigation ditches and works taking water therefrom, within the State of Wyoming, but aver that only about 25,000 acres of the lands designated on Exhibit I as irrigated lands were under irrigation at the time of the inception of the defendant's, The Laramie-Poudre Reservoirs and Irrigation Company's, rights to divert water through the tunnel mentioned in the bill of complaint, and which diversion is sought to be enjoined herein. Defendants deny that the map marked Exhibit B, attached to the bill of complaint, is a correct map of the drainage basin of the said river and its tributaries within the State of Colorado, and aver that Exhibit I, hereunto attached and made a part of this answer, is a true map of the last-mentioned drainage basin. Defendants admit that the larger part of the watershed of said river and its tributaries in Colorado is mountainous, rocky, and timbered, and aver that a large portion of the 3,865 square miles of the drainage area of said river and its tributaries in Wyoming is also mountainous, rocky, and timbered, upon which the precipitation of moisture is great, and from which the run-off is about 500,000 acre-feet annually. Defendants aver that a considerable part of the run-off from the drainage area of said river and its tributaries within Colorado enters the Laramie River after it enters the State of Wyoming. Defendants aver that about 4,000 acres of the drainage basin of said Laramie River and its tributaries within Colorado are of irrigable character. Defendants deny that the greater portion of the drainage area of said river and its tributaries in Wyoming is irrigable and productive, and aver that not to exceed 100,000 acres of the drainage area of the said river and its tributaries within the State of Wyoming are productive under irrigation; that of this area about 50,000 acres lie in said drainage area between the Colorado line and the Wheatland reservoir, as shown on Defendants' Exhibit I, which last mentioned area is located at a high altitude—to-wit, about 7,500 feet—where the irrigation season is short—to-wit, about six weeks—commencing about the fifteenth of June, and the lands of which are of inferior quality, unproductive, and adapted to only limited crops. Defendants further aver that the remaining portion of the lands in the drainage basin of said river and its tributaries, lying in the vicinity of Wheatland, aggregate about 50,000 acres. This land has some productivity, but the greater part of the irrigation rights therefor were initiated long after the inception of the rights through which these defendants make claim to divert a part of the waters of said river and its tributaries, through the tunnel mentioned in the bill of complaint. Defendants admit that prior to the Act of Congress of July 25, 1868, creating the Territory of Wyoming, that portion of the watershed and drainage basin of the Laramie River

and its tributaries which is now within the State of Wyoming was within the boundaries and subject to the laws of the Territory of Dakota, but deny that at any time the riparian proprietors on said stream had the right to have the waters of said stream or its tributaries flow across or along their lands unpolluted and undiminished. Defendants aver that at no time did the doctrine of riparian ownership of waters obtain in that part of Dakota Territory since said Act of Congress a part of the State of Wyoming. Defendants aver that at no time has it been the law that diversions of water from said stream or its tributaries in Wyoming, or diversions therefrom made in Colorado for application in Wyoming, could be made to the prejudice of the right of the State of Colorado in the exercise of her inherent sovereign power to divert from the section of the Laramie River within Colorado, the entire run-off of said section for use within the State of Colorado. Defendants aver that a change in the point of diversion, the place of use, and the kind of use, where the same is made from the section of the stream within Colorado, may at any time be made within the State of Colorado, provided the same can be done without prejudice to any existing appropriations used within Colorado. Defendants further aver that the waters of said stream and its tributaries, within the State of Colorado, constitute a part of the natural resources of the last-mentioned state, and were and are owned thereby, subject to the right of appropriation thereof under the laws of the State of Colorado for use therein. Defendants aver that the right of appropriation and use of the waters of said stream and its tributaries within Colorado is to no extent affected by or subject to the laws of any other sovereignty than that of the State of Colorado. As to whether or not the United States of America in 1862, or at any other time, granted to the Union Pacific Railway Company 350,000 acres of land, or any part thereof, within the State of Wyoming, riparian to the Laramie River and its tributaries, these defendants have not and cannot obtain sufficient knowledge or information upon which to base a belief. As to whether or not the last-mentioned lands, or any part thereof, have passed from said railroad company, or are at this time owned or possessed by 1,500 or any other number of people, these defendants have not and cannot obtain sufficient knowledge or information upon which to base a belief. These defendants deny that the right to the continuous flow of the waters of said river, or any part thereof, or any of the waters of its tributaries, is vested in the citizens of complainant. Deny that the doctrine of continuous flow or of riparian rights at any time obtained in the drainage basin of the Laramie River and its tributaries within the State of Wyoming. Deny that riparian rights in the waters of said river and its tributaries at any time attached to said 350,000 acres or any part thereof. Admit that prior to the commencement of construction of the system of irrigation having for its purpose the diversion by the defendants of a part of the waters of the Laramie River and its tributaries, some of the lands lying along said river and its tributaries had been settled and improved to a limited extent, and that some part thereof had been rendered more productive by irrigation from said stream



and its tributaries; but aver that the run-off of said river and its tributaries was ample to supply the demands and rights so created and leave an abundance of water to supply the diversions sought to be enjoined herein. Defendants deny that the lands of said area, without the use of the water, the diversion of which is sought to be enjoined herein, would be rendered valueless, and also deny that 20,000 people, or any other number in excess of 2,000, residing upon said lands, are supported, directly or indirectly, by reason of the irrigation and cultivation of said lands. Deny that \$20,000,000, or any sum in excess of \$500,000, had been expended in the development or use of the waters of said stream or its tributaries, prior to the initiation of the rights, the exercise of which is sought to be enjoined herein. As to whether or not 400,000 acres of land lying in the drainage basin of said river and its tributaries within the State of Wyoming, had been patented by the United States of America prior to the commencement of construction of its said system of irrigation by defendant The Laramie-Poudre Reservoirs and Irrigation Company, these defendants have not and cannot obtain sufficient knowledge or information upon which to base a belief. As to what number of acres of the last-mentioned land are now owned, possessed, or occupied by citizens of complainant, defendants have not and cannot obtain sufficient knowledge or information upon which to base a belief. Defendants admit that certain of the waters of said river and its tributaries are used by citizens of towns and villages in Wyoming, but aver that there is more than sufficient run-off in said stream and its tributaries to satisfy such needs and to supply the rights of the defendants sought to be enjoined in this suit. Admit the existence of certain appropriations from said river and its tributaries prior to the commencement of construction of defendant's system of irrigation, mentioned in the bill of complaint, but aver that the run-off of said stream and its tributaries was and is more than sufficient to satisfy the same and the diversions sought to be enjoined in this action. As to whether or not complainant is the proprietor of 50,000 acres of land within said watershed, these defendants have not and cannot obtain sufficient knowledge or information upon which to base a belief. Defendants admit that prior to the commencement of construction of defendant's irrigation system for the purpose of the diversions sought to be enjoined herein, certain citizens of the State of Colorado had appropriated, for the purpose of irrigating certain lands within said drainage basin, certain waters of said river and its tributaries, and aver that such appropriations amounted to about 8,000 acre-feet of water per annum. As to what part of said waters, applied within the drainage basin of Colorado, has heretofore returned to the stream and its tributaries, these defendants have not and cannot obtain sufficient knowledge or information upon which to base a belief. Defendants aver that other appropriations of said waters of said Laramie River and its said tributaries had been made by the State of Colorado and its citizens within the State of Colorado, prior to the appropriations of said waters by complainant and its citizens, as set forth in the complaint, and aver that on the 25th day of August, 1902, this defend-

ant, The Laramie-Poudre Reservoirs and Irrigation Company, and its predecessors in title, by commencement of construction, initiated its rights to the diversion, for the purpose of irrigation and domestic use, through the tunnel mentioned in the bill of complaint, to 1,235 second-feet of water, and that at the time of the initiation of such rights of the defendant, The Laramie-Poudre Reservoirs and Irrigation Company, and its predecessors in title, there was abundant water in the said stream to satisfy all prior appropriations then in existence, or theretofore initiated, in the State of Colorado and in the State of Wyoming. Defendants deny that, prior to the initiation or existence of the rights of diversion sought to be enjoined in the complaint, the plaintiff and its citizens had appropriated all of the available waters of the said Laramie River and its tributaries, but aver that at such time there was ample run-off in said stream, and that there is now ample water therein, to supply the proposed diversions of these defendants and all prior rights in the State of Wyoming. Defendants aver that at no time prior to the institution of this suit had more than 50,000 acre-feet annually been taken from said stream and its tributaries for use in the State of Wyoming. Defendants aver that, at the time of the initiation of the rights, the exercise of which are sought to be enjoined in this suit, rights of appropriation of water for irrigation and domestic use in the State of Wyoming had been created or initiated for not exceeding 50,000 acre-feet annually, and aver that at such time there was available, to supply such last-mentioned rights or initiated rights, more than 800,000 acre-feet annually in the run-off of said stream. As to whether or not the plaintiff had, and its citizens had, at any time employed the waters of said stream and its said tributaries, for the sub-irrigation of 25,000 acres of land riparian to said stream and its said tributaries, said land being owned and possessed by said complainant and its citizens, and for live-stock and domestic uses, these defendants have not and cannot obtain sufficient knowledge or information upon which to base a belief. Defendants deny that the waters sought to be diverted through the tunnel mentioned in the bill of complaint, would render the lands lying within the basin of said stream and its tributaries, within the State of Wyoming, to a large extent valueless and unable to support any considerable population. Deny that the use of the waters so sought to be enjoined would add the value of \$10,000,000 to the lands within said watershed within the State of Wyoming, or would enable said lands to support a population of 20,000 people, or any other considerable number of people. Deny that the diversions sought to be enjoined herein would render the lands in the watershed of said stream and its tributaries within Wyoming valueless. Defendants deny that they are threatening to divert by the tunnel mentioned in the bill of complaint, or otherwise, more than 100,000 acre-feet per annum of the waters of said stream and its tributaries, and aver that the maximum diversion which can be made through said tunnel, or the irrigation system in aid thereof, does not and cannot exceed 70,000 acre-feet annually from the run-off of said stream, which run-off amounts to about 800,000 acre-feet annually. Defendants deny



that there has been diverted in any manner within the State of Colorado, for application to a beneficial use within the drainage basin of said river and its tributaries, a larger amount of water than was necessary to the appropriations made prior to the rights of complainant and its citizens. Defendants aver that at no time has a greater amount of water been diverted from said stream, for application to a beneficial use within the State of Colorado, than the appropriations within the State of Colorado required; and that at such time there was ample water in said stream to satisfy such appropriations and all prior appropriations within the State of Wyoming. Defendants aver that the State of Colorado is the owner of all waters within said State of Colorado, with the full right to dispose of them as it may choose, and deny that such rights are subject to rights acquired by the complainant and its citizens. Aver that it is the right of the defendant commonwealth to dispose of the waters of that portion of said stream lying within the State of Colorado, without let or hindrance by the complainant or its citizens, and defendants aver that the defendant commonwealth can so dispose of the waters of said stream regardless of the prejudice that it may work to the complainant or its citizens within the State of Wyoming, and need give no reason for its will.

## II.

Defendants aver that defendant state was admitted into the Union August 1, 1876, and that at such date its Constitution contained, and ever since has contained, the following provisions, to-wit:

"The water of every natural stream, not heretofore appropriated, within the State of Colorado, is hereby declared to be the property of the public, and the same is dedicated to the use of the people of the state, subject to appropriation as hereinafter provided."

"The right to divert the unappropriated waters of any natural stream to beneficial uses shall never be denied. Priority of appropriation shall give the better right as between those using the water for the same purpose; but when the waters of any natural stream are not sufficient for the service of all those desiring the use of the same, those using the water for domestic purposes shall have the preference over those claiming for any other purpose, and those using the water for agricultural purposes shall have preference over those using the same for manufacturing purposes."

That in aid of such provisions, and of the pre-existing rights of appropriation of water for domestic, irrigation and manufacturing purposes from the natural streams of the defendant state, its successive legislatures have passed laws regulating such rights, and providing for their adjudication and administration at public expense; that at all times the courts of defendant state, its legislature, and administrative and judicial authorities, have considered and declared the waters of the natural streams of the defendant state to be the exclusive property of the people of the state, subject to appropriation for domestic and irrigation purposes exclusively within the state by the people of the defendant state; that the Laramie River rises in the mountains of Colorado, and flows therein for a distance of about

27 miles, and thereafter for the distance of about 150 miles in the State of Wyoming. Defendants aver that the proposed diversion sought to be enjoined herein is being undertaken by these defendants—citizens of defendant state—for domestic, irrigation, and manufacturing purposes, within the boundaries of defendant state; and, further, that such diversion is proposed from a section of said stream within defendant state. Defendants further aver that such proposed diversion is being undertaken under the authority and approval of defendant state, and that these defendants in so doing are exercising, with the approval and by permission of defendant state, one of its inalienable and inherent sovereign rights; that is, the right to avail itself, through its citizens, of one of its great natural resources. Defendants aver that, in making the diversion threatened, the defendant state, through its citizens, its co-defendants, is exercising one of its sovereign rights.

### III.

Defendants aver that the Laramie River rises in the mountains of Colorado, flows therein about 27 miles, and thence 150 miles in the State of Wyoming, to its union with the North Platte River; thence its waters pass into the State of Nebraska and join with the South Platte River at the city of North Platte, Nebraska; the two rivers forming the Platte River, which proceeds in an easterly direction through the State of Nebraska to its junction with the Missouri River at Plattsmouth, near the city of Omaha. Irrigation is carried on from these streams in the States of Colorado, Wyoming, and western Nebraska, to a point on the Platte River as far east as the one hundredth Meridian, which crosses about fifty miles below the city of North Platte, at the junction of the two rivers, the North Platte and the South Platte. Aver that the drainage area of said stream in Colorado and Wyoming is about 4,293 square miles, the drainage area within Colorado about 428 square miles, and the drainage area in Wyoming about 3,865 square miles; that the drainage area of the section of the stream tapped by the diversion in question is about 75 square miles, lying along the upper reaches of the said stream and some of its tributaries, and within defendant state; that the total run-off of the Laramie River and its tributaries within said states, or for the full length of said stream, is about 800,000 acre-feet annually; that the annual run-off of the Laramie River and its tributaries within the State of Wyoming is about 500,000 acre-feet, and within Colorado about 300,000 acre-feet; that of this run-off within Colorado the diversion sought to be enjoined herein will take from the stream and its tributaries not exceeding 70,000 acre-feet annually.

Defendants aver that if the proposed diversion sought to be enjoined herein is made, it will take from the run-off of said stream and its tributaries of 800,000 acre-feet annually, not to exceed 70,000 acre-feet, and that 300,000 of said total acre-feet is supplied by the watershed of said stream within the State of Colorado. Defendants further aver that the natural conditions are such that at no time can there be diverted from the section of said stream within

Colorado, or any other part of said stream, for application to a beneficial use—that is, for irrigation and domestic purposes—within Colorado, exceeding 90,000 acre-feet annually, and if the diversion sought to be enjoined herein is made, at no time can the diversions from said river and its tributaries for use within Colorado exceed 90,000 acre-feet annually.

Defendants aver that defendant irrigation district is the owner of the right to divert about 8,000 acre-feet annually of the waters of said stream for application to irrigation and domestic purposes within the State of Colorado; that such right was initiated and perfected by construction and application to beneficial uses—to-wit, irrigation of lands and domestic use—by the predecessors in title of the defendant district, long prior to the institution of the present suit, and at a time when there was ample water within the Laramie River to satisfy the last-mentioned diversion and all appropriations theretofore initiated from said stream within the State of Wyoming; that such rights for many years last past have been applied by the defendants and their predecessors in title, for irrigation purposes and domestic uses, within the watershed of said stream within the State of Colorado.

Defendants also, as other and further rights by appropriation and initiated appropriation to the waters of the Laramie River and its tributaries, aver that prior to the institution of the present suit, and on, to-wit, August 25, 1902, one of the predecessors in title of these defendants conceived and planned an extensive irrigation system, consisting of collection ditches along the upper reaches of the Laramie River and its tributaries, a tunnel reservoir on the upper part of said stream, a tunnel through the mountain range forming the eastern watershed of the Laramie River, the use as a part of the system of a section of the Poudre River, and the building of an extensive system of ditches and reservoirs for the application of the water sought to be so diverted to about 125,000 acres of land in the Poudre Valley; that prior to the institution of this suit—that is, on August 25, 1902—the construction of said system was begun by a predecessor in title of these defendants, and the construction has with diligence been pursued since; that at the time of such commencement of construction, and long after, there was ample unappropriated water in said stream, after satisfying all priorities that had theretofore been initiated in the States of Wyoming and Colorado, to supply the water so sought to be appropriated from the Laramie River by such proposed system of irrigation; that defendants are the owners of all rights so initiated on August 25, 1902.

Defendants aver that prior to the institution of this suit—that is, in April, 1909—under and pursuant to the laws of the State of Colorado, an irrigation district—that is, the defendant, The Greeley-Poudre Irrigation District—was formed, embracing 125,000 acres of land; that the land so erected into an irrigation district is in the Poudre Valley, in Weld County, in defendant state; is at an altitude of about 5,000 feet, and under irrigation, of great productivity, but of little value without irrigation; that about an acre-foot of water artificially supplied annually to the annual precipitation on said

lands will render said lands very productive in growing alfalfa, fruits, potatoes, sugar beets, and various kinds of grains; that \$5,000,000 of bonds were voted by said district and levied upon the said lands—that is, the said 125,000 acres—which, or the proceeds of which, were to be used for the procuring of an adequate system of irrigation for the lands of said district; that in September, 1909, prior to the institution of the present suit, a contract was entered into between the defendant The Laramie-Poudre Reservoirs and Irrigation Company, and the defendant The Greeley-Poudre Irrigation District, whereby the defendant district agreed to pay to defendant company the said \$5,000,000 of bonds for the above system of irrigation completed; that at the time of the contract a large amount of construction had been done by the defendant company and its predecessors in title, and large sums had been paid out on such construction and the acquisition of valuable water rights and rights of way; that at the date of the institution of this suit there had been expended on the construction of said system and in the purchase thereof about \$2,000,000, and that there has now been expended on the purchase and construction of the system about \$2,700,000; that about \$500,000 of said amount has been expended on the said tunnel reservoir and collection ditches, and about \$600,000 on the said tunnel; that there now remains in the treasury of said district about \$2,300,000 of said bonds, par value, which are being devoted and will be applied to the completion of said system of irrigation; that, relying upon the adequacy of said system of irrigation and the carrying into effect of the said plans therefor, lands were purchased in said district by the citizens of this defendant state, and other citizens, lands were filed upon therein under the desert land laws and the homestead laws by various citizens, and much labor has been done and valuable improvements have been made in developing said lands; that the sufficiency of said water supply will be materially impaired, should the defendant district be deprived of the water—to-wit, about 70,000 acre-feet—relied upon through said proposed Laramie River diversion. Defendants aver that the value of said lands in said district, and of all of the improvements thereon, will be seriously impaired, should the said Laramie River diversion be denied to these defendants. Defendants further aver that, should said waters be denied to these defendants, and the same be applied upon lands within the State of Wyoming, the same will not procure the abundant results in crops as if applied upon the lands lying within the said irrigation district. Defendants aver that the greater part of the lands within the State of Wyoming, to which said water will be applied, if the proposed diversion is enjoined, lie at an altitude of about 7,500 feet; that the irrigation season there is short, being only about six weeks; that the land is of an inferior quality for all character of crops, and that water applied thereto for irrigation purposes produces comparatively small results.

Defendants aver that the plaintiff and its citizens, long prior to the institution of this suit and at all times, were fully advised of the said diversions and proposed diversion of these defendants and their predecessors in title, and have been advised of the formation of said

district, of the voting of the bonds thereof, of the sale of said bonds to innocent purchasers for value, of the said construction for the purpose of effecting said diversion, and of the steps taken by citizens in said district in reliance thereon.

Defendants aver that plaintiff and its citizens are equitably estopped from questioning the diversion sought to be enjoined herein.

#### IV.

Defendants aver that, long prior to the institution of the present suit, and while there was ample water in the Laramie River to satisfy all priorities theretofore initiated therein in the States of Wyoming and Colorado—that is to say, while there was an annual run-off in said stream of about 800,000 acre-feet, and the prior appropriations for irrigation and domestic purposes in the State of Wyoming did not exceed 50,000 acre-feet annually—the predecessors in title of these defendants diverted water from the Laramie River and applied the same to a beneficial use—that is, for irrigation and domestic purposes in the watershed of the Laramie River within the State of Colorado; that such last-mentioned diversions have for many years past been used in the cultivation of lands lying within the drainage area of the Laramie River within Colorado, and that the amount of such diversions is about 8,000 acre-feet annually; that the rights so created have been adjudicated under the Water Adjudication Statutes of Colorado, in favor of the predecessors in title of these defendants, and that the defendant district is now the owner of all rights so initiated.

Defendants also aver, as further and other rights, by appropriation and initiated appropriation, to the waters of the Laramie River and its tributaries, that long prior to the institution of this suit—to-wit, August 25, 1902—and while there was abundant unappropriated water in the run-off of the Laramie River and its tributaries within Colorado to supply all appropriations theretofore initiated for use in Wyoming, and also the diversion sought to be enjoined herein, that the predecessors in title of these defendants initiated, by the commencement of actual construction on August 25, 1902, the water rights which are sought to be exercised by diversion through the tunnel mentioned in the bill of complaint; that, since such initiation, the defendants and their predecessors in title have diligently, by continuous work and expenditures on the construction of an extensive irrigation system, preserved the rights so initiated. Defendants aver that, in perfecting the rights so initiated, the defendants and their predecessors in title conceived an extensive irrigation system, consisting of collection ditches, tunnel reservoirs, and other reservoirs on the upper reaches of the Laramie River, a tunnel over two and a quarter miles in length, now entirely completed, and extending from the Laramie River through the mountain range constituting the eastern boundary of the watershed of said stream, for the diversion, carriage, and distribution into the bed of the Cache la Poudre River, a public stream of Colorado, for carriage down and along said stream to and into the ditches, reservoirs, and distributing system of said district for irrigation, as permitted by the laws, usages, customs, and

judicial decisions of the courts of the State of Colorado—all for the purpose of applying the rights so initiated to a beneficial use; that is, for domestic purposes and for the irrigation of the lands lying within The Greeley-Poudre Irrigation District. Defendants aver that bonds were voted for the purpose of the purchase of the rights so initiated, and the construction partially made, and the construction to completion of said irrigation system; that said bond issue amounted to \$5,000,000, and was made a first and prior lien upon all the lands of said district, and that, of said bond issue, approximately \$2,700,000 has been sold to innocent purchasers for value throughout the United States, and the proceeds thereof used upon the purchase and construction of said system of works, and that said bonds for their payment, principal and interest, are largely dependent upon the use of the diversions from the Laramie River sought to be enjoined herein; that a contract was entered into between the defendants, The Laramie-Poudre Reservoirs and Irrigation Company and the Greeley-Poudre Irrigation District, for the purchase of said system completed; that parts of said system have already been conveyed by the defendant company to the defendant district, and that the defendant company is under contract to complete the construction of and make conveyance of all the remainder of said system to the defendant district; that the defendant district is planning to divert and will divert, through said system of irrigation works, from the Laramie River and its tributaries, not more than 70,000 acre-feet annually, and that it is not practicable, on account of the physical conditions surrounding the Laramie River and its tributaries to divert from the Laramie River and its tributaries within the state of Colorado, for application to a beneficial use within the State of Colorado, exceeding 90,000 acre-feet annually. Defendants aver that the annual run-off of said stream and its tributaries furnishes abundant water to satisfy all appropriations in Wyoming earlier in date than those sought to be enjoined herein, and also to satisfy those water rights claimed through defendants' said system of irrigation.

These defendants, now having fully answered all the allegations in the complainant's bill of complaint, or so much thereof as the defendants are advised should be answered, ask to be hence dismissed, with costs and charges in this behalf sustained.

THE LARAMIE-POUDRE RESERVOIRS  
AND IRRIGATION COMPANY,

By JULIUS C. GUNTER,  
CHARLES D. HAYT,  
CLYDE C. DAWSON,  
FRED F. WRIGHT, *Its Counsel.*

THE GREELEY-POUDRE IRRIGATION  
DISTRICT,

By CHARLES F. TEW,  
DELPH E. CARPENTER, *Its Counsel.*

(Here follows map marked p. —.)



(Endorsed:) Supreme Court U. S. October Term, 1912. No. 8, Original. The State of Wyoming, Complainant, vs. The State of Colorado et al. Answer of the defendants Laramie-Poudre Reservoir & Irrigation Company & The Greeley Poudre Irrigation District. Filed January 8, 1913.

And afterwards, towit, on the 20th day of January, A. D. 1913, proof of service of answer was filed in words & figures following, viz:

In the Supreme Court of the United States.

In Equity.

No. 8, Original.

THE STATE OF WYOMING, Complainant,

VS.

THE STATE OF COLORADO, THE GREELEY-POUDRE IRRIGATION DISTRICT, a Municipal Corporation; The Laramie Poudre Reservoirs and Irrigation Company, a Corporation, Defendants.

*Acknowledgment of Service.*

Receipt of six (6) copies of the Answer on behalf of the State of Colorado in the above entitled matter, is hereby acknowledged at Cheyenne, Wyoming, this 6th day of January A. D. 1913.

D. A. PRESTON,

*Attorney General of Wyoming.*

And afterwards, towit, on the 7th day of April, A. D. 1913, motion for leave to file Replication was filed in words & figures following, viz:

In the Supreme Court of the United States.

In Equity.

No. 8, Original.

THE STATE OF WYOMING, Complainant,

VS.

THE STATE OF COLORADO, THE GREELEY-POUDRE IRRIGATION DISTRICT, a Municipal Corporation; The Laramie Poudre Reservoirs and Irrigation Company, a Corporation, Defendants.

*Application for Leave to File Replications.*

Comes now the said complainant, The State of Wyoming, and hereby makes application to the said Honorable Court for leave to file its replication to the separate answer of the defendant, The State



of Colorado, and its replication to the joint and several answer of the defendants, The Greeley-Poudre Irrigation District and The Laramie-Poudre Reservoirs and Irrigation Company, in said cause, and complainant will ever pray, etc.

DOUGLAS A. PRESTON,  
*Attorney General of the State of Wyoming and  
 Solicitor and of Counsel for the Plaintiff.*

— — —  
 — — —  
*Of Counsel.*

In the Supreme Court of the United States.

In Equity.

No. 8, Original.

THE STATE OF WYOMING, Complainant,

vs.

THE STATE OF COLORADO, THE GREELEY-POUDRE IRRIGATION DISTRICT, a Municipal Corporation; The Laramie Poudre Reservoirs and Irrigation Company, a Corporation, Defendants.

*Notice.*

To the State of Colorado, The Greeley-Poudre Irrigation District, and The Laramie-Poudre Reservoirs and Irrigation Company, Defendants:

You will please take notice that at the incoming of the Supreme Court of the United States at twelve o'clock M., at the Capitol Building, April 1, 1913, or as soon thereafter as solicitors can be heard, the above named complainant will appear by its solicitors and present to said court an application for leave to file its replication to the separate answer of the defendant, the State of Colorado, and its replication to the joint and several answer of the defendants, the Greeley-Poudre Irrigation District and the Laramie Poudre Reservoirs and Irrigation Company, in said cause: when and where you may be present if you so desire. A copy of which application is presented herewith.

DOUGLAS A. PRESTON,  
*Attorney General of the State of Wyoming and  
 Solicitor and of Counsel for the Plaintiff.*

— — —  
 — — —  
*Of Counsel.*

STATE OF COLORADO,  
 County of Denver, ss:

Service of the foregoing notice, by the delivery to me of a copy thereof with a copy of the foregoing application for Leave to File

Replications, is hereby acknowledged, this 24th day of March, A. D. 1913.

FRED FARRAR,  
*Attorney General of the State of Colorado and*  
*Solicitor for said State, Defendant.*  
 CHARLES F. TEW,  
 D. E. CARPENTER,  
*Solicitor for the Greeley-Poudre Irrigation District, Defendant.*  
 JULIUS C. GUNTER,  
*Solicitor for the Laramie-Poudre Reservoirs*  
*and Irrigation Company, Defendant.*

(Endorsed:) Supreme Court U. S. October Term, 1912. No. 8, Original. The State of Wyoming, Complainant, vs. The State of Colorado et al. Motion for leave to file Replications, with notice & proof of service of same. Filed April 7, 1913.

And on the same day, to wit, on the 7th day of April, A. D. 1913, the following entry appears of record, viz:

8, Original.

THE STATE OF WYOMING, Complainant,  
 VS.  
 THE STATE OF COLORADO et al.

On motion of Mr. Joseph W. Cox in behalf of Mr. Douglas A. Preston, of Counsel for the complainant leave is hereby granted to file replication to answers in this cause.

April 7, 1913.

And on the same day to wit, on the 7th day of April, A. D. 1913, Replications were filed in words & figures following, viz:

In the Supreme Court of the United States.

In Equity.

No. 8, Original.

THE STATE OF WYOMING, Complainant,  
 VS.  
 THE STATE OF COLORADO, THE GREELEY-POUDRE IRRIGATION DISTRICT, a Municipal Corporation; The Laramie Poudre Reservoirs and Irrigation Company, a Corporation, Defendants.

*Replication to the Answer of Defendant The State of Colorado.*

The complainant, The State of Wyoming, repliant, saving and reserving unto itself all and all manner of advantage of exception to

the manifold insufficiencies of the answer of the defendant, The State of Colorado, for replication thereunto saith that it will aver and prove its bill of complaint herein to be true, certain and sufficient in the law to be answered unto, and that the said answer of the said defendant is uncertain, untrue and insufficient to be replied unto by this repliant; without this, that any other matter or thing whatsoever in the said answer contained, material or effectual to be replied unto, confessed and avoided, traversed or denied, is true; all which matters and things this repliant is, and will be, ready to aver and prove as this honorable court shall direct, and humbly prays as in and by its said bill it hath already prayed

DOUGLAS A. PRESTON,

*Attorney General of the State of Wyoming and  
Solicitor and of Counsel for the Plaintiff.*

— — — — —

*Of Counsel.*

(Endorsed:) Supreme Court, U. S. October Term, 1912. No. 8, Original. The State of Wyoming, Complainant, vs. The State of Colorado et al. Replication to Answer of Defendant The State of Colorado. Filed April 7, 1913.

In the Supreme Court of the United States.

In Equity.

No. 8, Original.

THE STATE OF WYOMING, Complainant,

VS.

THE STATE OF COLORADO, THE GREELEY-POUDRE IRRIGATION District, a Municipal Corporation; The Laramie Poudre Reservoirs and Irrigation Company, a Corporation, Defendants.

*The Replication of the Complainant The State of Wyoming to the Joint and Several Answer of the Defendants The Laramie-Poudre Reservoirs and Irrigation Company and The Greeley-Poudre Irrigation District.*

This repliant, The State of Wyoming, saving and reserving unto itself all and all manner of advantage of exception to the manifold insufficiencies of the joint and several answer of the defendants. The Laramie-Poudre Reservoirs and Irrigation Company and The Greeley-Poudre Irrigation District, to the bill of complaint of this repliant, for replication thereunto saith that it will aver and prove its said bill to be true, certain and sufficient in the law to be answered unto, and that the said answer of the said defendants is uncertain, untrue and insufficient to be replied unto by this repliant; without this, that any other matter or thing whatsoever in the said answer

contained, material or effectual to be replied unto, confessed and avoided, traversed or denied, is true; all which matters and things this repliant is, and will be, ready to aver and prove as this honorable court shall direct, and humbly prays as in and by its said bill it hath already prayed.

DOUGLAS A. PRESTON,  
*Attorney General of the State of Wyoming and  
 Solicitor and of Counsel for the Plaintiff.*

— — —,  
 — — —,  
*Of Counsel.*

(Endorsed:) Supreme Court U. S. October Term, 1912. No. 8, Original. The State of Wyoming, Complainant, vs. The State of Colorado et al. Replication to answer of defendants. The Laramie-Poudre Reservoirs & Irrigation Company and The Greeley-Poudre Irrigation District. Filed April 7, 1913.

And afterwards, to wit, on the 9th day of April, A. D. 1913, a motion for leave to withdraw appearance was filed in words & figures following, viz:

Supreme Court of the United States, October Term, 1912.

No. 8, Original.

THE STATE OF WYOMING, Complainant,

vs.

THE STATE OF COLORADO, THE GREELEY-POUDRE IRRIGATION DISTRICT, a Municipal Corporation; The Laramie-Poudre Reservoirs and Irrigation Company, a Corporation,

Now come Charles D. Hayt and Clyde C. Dawson, who have heretofore entered their appearance as appearance as counsel for The Laramie-Poudre Reservoirs and Irrigation Company, one of the defendants in the above entitled cause, and move the Court for leave to withdraw said appearance.

CHARLES D. HAYT.  
 CLYDE C. DAWSON.  
 FRED R. WRIGHT.

(Endorsed:) Supreme Court U. S. October Term, 1912. No. 8, original. The State of Wyoming, Complainant, vs. The State of Colorado et al. Motion of Charles D. Hayt & Clyde C. Dawson for leave to withdraw their appearance as counsel for one of the defendants. Filed April 9, 1913.

And afterwards, to wit, on the 11th day of April, A. D. 1913, the following entry appears of record, viz:

## 8, Original.

THE STATE OF WYOMING, Complainant,

vs.

THE STATE OF COLORADO et al.

On motion of Mr. Duane E. Fox in their behalf, leave is hereby granted Mr. Charles D. Hayt and Mr. Clyde C. Dawson to withdraw their appearance for the defendants in this cause.

April 11, 1913.

And afterwards, to wit, on the 26th day of May, A. D. 1913, motion to appoint Commissioners was filed in words & figures following, viz:

In the Supreme Court of the United States.

In Equity.

No. 8, Original.

THE STATE OF WYOMING, Complainant,

vs.

THE STATE OF COLORADO, THE GREELEY-POUDRE IRRIGATION DISTRICT, a Municipal Corporation; The Laramie-Poudre Reservoirs and Irrigation Company, a Corporation, Defendants.

*Application for Appointment of Commissioner to Take Testimony.*

Come now the complainant and the defendants in the above entitled cause, by their respective attorneys, and move the Court that Clyde N. Watts, of Cheyenne, State of Wyoming, and Newton Garbutt, of Denver, State of Colorado, be appointed special commissioners to take the testimony in this cause as per stipulation hereto attached.

DOUGLAS A. PRESTON,

*Attorney-General of the State of Wyoming and  
Solicitor and of Counsel for the Plaintiff.*

FRED FARRAR,

*Attorney-General of the State of Colorado and  
Solicitor for said State, Defendant.*

CHARLES F. TEW,

D. E. CARPENTER,

*Solicitors for the Greeley-Poudre Irrigation District, Defendant.*

JULIUS C. GUNTER,

*Solicitor for the Laramie-Poudre Reservoirs  
and Irrigation Company, Defendant.*

In the Supreme Court of the United States.

In Equity.

No. 8, Original.

THE STATE OF WYOMING, Complainant,

vs.

THE STATE OF COLORADO, THE GREELEY-POUDRE IRRIGATION District, a Municipal Corporation; The Laramie-Poudre Reservoirs and Irrigation Company, a Corporation, Defendants.

*Stipulation.*

Subject to the order and consent of the Court, it is hereby stipulated by and between the complainant and defendants, by their respective attorneys, that Clyde M. Watts, of Cheyenne, State of Wyoming, be appointed a special commissioner to take and return the testimony in this cause, offered on behalf of the complainant.

That Newton Garbutt, of Denver, State of Colorado, be appointed a special commissioner to take and return the testimony in this cause offered on behalf of the defendants, or any of them.

That each shall have the power of a Master in Chancery, as provided in the rules of this Court, but said commissioners shall not make any findings of fact or state any conclusions of law.

It is further stipulated that the taking of testimony on complainant's behalf shall begin on the 15th day of August, 1913, at such place as counsel for complainant may designate, ten days' notice thereof to be given to counsel for defendants, and shall be concluded within one hundred days thereafter; and the taking of the testimony on behalf of the defendants shall commence on or before fifteen days after the conclusion of the testimony offered on behalf of the complainant and shall be concluded within one hundred days thereafter; and the testimony in rebuttal shall be commenced on or before ten days after the conclusion of the testimony offered on behalf of defendants, five days' notice of the place being given, and shall be concluded within forty days thereafter.

The said commissioners shall receive, as agreed by the parties, as their sole compensation for all services and for all testimony taken and transcribed, the sum of fifteen cents per folio for the original transcript and the further sum of five cents per folio for each carbon copy thereof, together with actual and necessary traveling ex-

penses incurred in the taking of the testimony as aforesaid. Dated this 26th day of May, 1913.

DOUGLAS A. PRESTON,  
*Attorney-General for the State of Wyoming and  
Solicitor and of Counsel for the Plaintiff.*

FRED FARRAR,  
*Attorney-General of the State of Colorado and  
Solicitor for said State, Defendant.*

CHARLES F. TEW,  
D. E. CARPENTER,  
*Solicitors for the Greeley-Poudre Irrigation District, Defendant.*

JULIUS C. GUNTER,  
*Solicitor for the Laramie-Poudre Reservoirs  
and Irrigation Company, Defendant.*

(Endorsed:) Supreme Court U. S. October Term, 1912. No. 8, Original. The State of Wyoming, Complainant, vs. The State of Colorado et al. Motion for appointment of Commissioners to take testimony & stipulation in relation to taking testimony. Filed May 26, 1913.

And afterwards, to wit, on the 10th day of June, A. D. 1913, the following order appears of record, viz:

Supreme Court of the United States, October Term, 1912.

No. 8, Original.

THE STATE OF WYOMING, Complainant,

vs.

THE STATE OF COLORADO et al.

On consideration of the motion and stipulation of counsel for the respective parties in this cause for the appointment of Special Commissioners to take and return the testimony in this cause,

It is now here ordered by the Court that Clyde M. Watts be, and he is hereby, appointed Special Commissioner to take and return the testimony in this cause offered on behalf of the complainant, and that Newton Garbutt be, and he is hereby, appointed Special Commissioner to take and return the testimony in this cause offered on behalf of the defendants or any of them, and that each shall have the power of a Master in Chancery, as provided in the Rules of this Court, but said Commissioners shall not make any findings of fact or state any conclusions of law.

It is further ordered that the taking of testimony on behalf of the complainant shall begin on August 15th, 1913, at such place as counsel for the complainant may designate, ten days' notice thereof to be given to counsel for defendants, and shall be concluded within one hundred days thereafter; and the taking of the testimony on be-



half of the defendants shall commence on or before fifteen days after the conclusion of the testimony offered on behalf of the complainant and shall be concluded within one hundred days thereafter; and the testimony in rebuttal shall be commenced on or before ten days after the conclusion of the testimony offered on behalf of the defendants, five days' notice of the place being given, and shall be concluded within forty days thereafter.

It is further ordered, in pursuance of said stipulation, that the said Commissioners shall receive as their sole compensation for all services and for all testimony taken and transcribed, the sum of fifteen cents per folio for the original transcript and the further sum of five cents per folio for each carbon copy thereof, together with actual and necessary travelling expenses incurred in the taking of the testimony.

June 10, 1913.

And afterwards, to wit, on the 19th day of May, A. D. 1916, a joint motion was filed in the words & figures following, viz:

In the Supreme Court of the United States.

In Equity.

No. 7, Original.

THE STATE OF WYOMING, Complainant,  
vs.

THE STATE OF COLORADO, THE GREELEY-POUDRE IRRIGATION District, a Municipal Corporation; The Laramie-Poudre Reservoirs and Irrigation Company, a Corporation, Defendants.

*Motion.*

Come now the above named parties by their respective counsel and show unto the court that the taking of evidence in said cause has been completed and that the parties have agreed upon an abstract thereof embracing such of the exhibits as may be readily reproduced, and to expedite the final hearing of said cause the parties do jointly move the court as follows:

1. That permission be granted to file herein for reference the original typewritten transcript of the evidence together with all exhibits introduced by the respective parties, and that the abstract of the testimony as agreed upon by the parties, together with the selected exhibits, be printed at the joint expense of the parties and filed herein in lieu of printing the entire transcript.

2. That an order be entered granting unto the plaintiff to and including July 15, 1916, within which to file a brief herein and granting unto the defendants to and including September 5, 1916, within which to file their briefs herein, and granting unto the plain-

tiff twenty days after the filing of the briefs on behalf of the defendants within which to file its reply brief.

3. That an order be entered herein advancing this cause upon the calendar and assigning it for argument upon the first day of the October, A. D. 1916, term of this court, or as soon thereafter within said term as to the court shall be convenient, and enlarging the time for oral argument to four hours upon each side.

DOUGLAS A. PRESTON,  
*Attorney General of Wyoming,*  
*of Counsel for Plaintiff.*

FRED FARRAR,  
*Attorney General of Colorado,*  
*of Counsel for Defendant State of Colorado.*

JULIUS C. GUNTER,  
*Attorney for Defendant Laramie-Poudre*  
*Reservoirs & Irrigation Company.*

DELPH E. CARPENTER,  
*Attorney for Defendant Greeley-*  
*Poudre Irrigation District.*

(Endorsed:) Supreme Court, U. S. October Term, 1915. No. 7, Original. The State of Wyoming, Complainant, vs. The State of Colorado et al. Joint motion as to filing original type-written transcript of evidence and exhibits, abstract of evidence and briefs, and that cause be set down for hearing. Filed May 19, 1916.

And afterward, to wit, on the 22d day of May, A. D. 1916, the following entry appears of record, viz:

No. 7, Original.

STATE OF WYOMING, Complainant,  
vs.  
STATE OF COLORADO et al.

Mr. Charles S. Thomas in behalf of counsel submitted to the consideration of the Court a joint motion as to filing the original type-written transcript of evidence and exhibits, abstract of evidence, and briefs, and that the cause be set down for hearing.

May 22, 1916.

And afterwards, to wit, on the 5th day of June, A. D. 1916, the following order appears of record, viz:

Supreme Court of the United States, October Term, 1915.

No. 7, Original.

STATE OF WYOMING, Complainant,

VS.

THE STATE OF COLORADO et al.

On consideration of the joint motion of the parties as to filing original typewritten transcript of evidence, together with all exhibits introduced and the abstract of the testimony as agreed upon together with selected exhibits to be printed at joint expense of the parties, and as to the filing of briefs, that the case be set down for hearing, and to fix the time to be allowed for the oral argument.

It is now here ordered by the court that the said motion be, and the same is hereby, granted, and the case set down for hearing on the first Monday in December next.

It is further ordered that the motion to fix the time to be allowed for the oral argument be denied without prejudice.

June 5, 1916

And on the same day, to wit, on the 5th day of June, A. D. 1916, the abstract of evidence was filed in words & figures following, viz:

In the Supreme Court of the United States.

In Equity.

No. —, Original.

THE STATE OF WYOMING, Complainant,

VS.

THE STATE OF COLORADO, THE GREELEY-POUDRE IRRIGATION DISTRICT, a Municipal Corporation, and The Laramie-Poudre Reservoirs and Irrigation Company, a Corporation, Defendants.

#### ABSTRACT OF THE EVIDENCE.

NOTE.—For convenience, the following exhibits have been reproduced in the abstract:

Complainant's Exhibits B. E. F. I. J. K. L. M. T-3, T-4, T-5, T-6, T-7, T-8 and T-9.

Defendants' Exhibits 113, 123, 124, 125, 126, 127, 128, 129, 131, 143, 144, and 145.

All other exhibits are filed with the transcript of the evidence.

NOTE.—The marginal numerals refer to the pages of the original transcript.

The complainant above named, to maintain the issues on its behalf, introduced the following evidence before Clyde M. Watts,

special commissioner, commencing at Cheyenne, Wyoming, August 18, 1913.

Appearances:

For the complainant: D. A. Preston, Esq., Attorney-General of the State of Wyoming; N. E. Corthell, Esq.; John D. Clark, Esq.

For defendant, The State of Colorado: Fred Farrar, Esq., Attorney General of the State of Colorado.

For the defendant, The Greeley-Poudre Irrigation District: Delph E. Carpenter, Esq.; Charles F. Tew, Esq.

For The Laramie-Poudre Reservoirs and Irrigation Company: Julius C. Gunter, Esq., by Fred Farrar.

- 2 Stipulation waiving signatures of the witnesses.

*Direct Evidence in Behalf of Complainant.*

M. R. JOHNSTON, a witness in behalf of the Complainant.

Direct examination by Mr. John D. Clark:

- 3 From November, 1888, to June 1, 1912, I was Superintendent of Wyoming Development Company and had full personal charge of its irrigation system. That Company's reservoir is sixteen miles east of the Union Pacific Railroad, and east of Lookout on the Laramie River. Sixteen miles further down the river a tunnel diverts the water into the Blue Grass whence into the Sybille.

- 4 About a mile and a half down we take out Canal No. 1. Eight miles on down the Sybille we take out No. 3, and two or three miles further down Canal No. 2.

The reservoir is about sixty-five miles below the Colorado line. The tunnel and Canals Nos. 1 and 2, and the diversion dam and connection from the tunnel to the river had been completed when I went there in 1888 and were in good condition. Water had then been run through the system which was used to full capacity at certain seasons every year I was there.

- 5 A few settlers were there when I came. They arrived in considerable numbers in 1893 and 1894. Before that the Company did the irrigating, after that the settlers. 35,000 to 40,000 acres of land were irrigated in 1912. When they first started in 1893 and 1894 the settlers irrigated three to five thousand acres. The principal change in the irrigating system since 1888 was the building of No. 1 and No. 2. reservoirs. No. 1 is located on the Company's land.

- 6 No. 2 is the reservoir up on the Laramie River. The survey for it was begun in 1894 or '95. Construction work began about 1899 and the reservoir was completed about 1900. The estimated capacity of that reservoir is 126,000 acre feet. Since 1888 the dam at the tunnel has been changed, and a new race-way into the tunnel built. This did not to any great extent increase the

capacity of the system. Canal No. 1 has also been extended over the Bordeaux land.

7 These lie adjoining and south and east of the original lands. Canal No. 1 had been built across the railroad in 1888. It has had no extensions since its original construction except the Bordeaux lateral. Canal No. 2 is as originally built.

Canal No. 3 was built in 1894 or '5.

The Sybille Canal was begun about four years ago and is not completed. The Bordeaux lateral was commenced six or seven years ago and completed the next year, and since then has been constantly in use.

8 The Bordeaux lateral diverts water from Canal No. 1 to the south. No enlargement made above that in Canal No. 1 except to clean it out at points. The canals were run to full capacity once each year during high water. Other times in the year we ran through practically all the water we could get; this did not equal the capacity of the ditches except two or three years while I was there; after the first of July generally we were short of water.

We aimed to take about all we could get except what filtered through. Of course we had to let some go down when the fellows below on the river 'hollered' too loud but we aimed to use most of the water. Never knew the water to run over the top of the diversion dam except in case of water spouts on one or two or three occasions.

9 One of the times we had extremely high water from about the first of June to the 10th of July. That is the only season I can recall when such a thing occurred. In 1888 the town of Wheatland was there with one building at that time, and a few farmers on the land farming for the Company. There are now on the Wheatland flats and in the town 4,500 to 5,000 people.

10 1,500 to 2,000 of these live in the town. Those who live outside the town are farmers who get their water for irrigating from the Development Company's canal. The new dam and race-way to the tunnel were constructed six or seven years ago. Prior to that the tunnel had been filled through the original race-way. The circular and map handed me were prepared by the Development Company before I was employed there. J. A. Johnston was then Superintendent.

11 The map shows the ditches as they were when I took charge, and is correct. The lands within the shaded boundary are the lands owned by the Development Company and to irrigate which the ditches were constructed. They amount to about 60,000 acres. Not all of it has been reduced to cultivation.

12 The map and circular were for advertising purposes. As a result of applying the water through this irrigation system the lands have been producing crops of all kinds. No crops were produced on the land prior to the irrigation. The use of water was necessary for the growing of crops.

## M. R. JOHNSTON.

Cross-examination by Mr. Delph E. Carpenter:

13 J. A. Johnston, manager and superintendent of Wheatland project in 1888 is my brother. Clarence T. Johnston, formerly State Engineer of Wyoming, is my nephew. Clarence T. Johnston not engineer on original project. Before going into State Engineer's office he was engineer on No. 1 reservoir, located in Wheatland tract. Completed under his engineering supervision. G. W. Zorn was engineer on No. 2 reservoir on west side of Laramie mountains. Cannot say for what time J. A. Johnston was general

14 manager prior to 1888, but he took hold of project shortly after tunnel was started and completed it. Cannot give date when tunnel was started, but it was at least three or four years before I went on project. J. A. Johnston left Wyoming Development Company in 1888. I succeeded him as superintendent. After two or three years, general manager, Gilchrist, died. Cannot recollect date, but my brother was elected president and general manager for one year. Governor Carey was elected on my brother's resignation president and general manager and still is president. Robert D. Carey, his son, has been general manager for last three years, ever since Governor Carey was elected Governor. Have had immediate management of irrigation system and business at Wheatland since

15 1888. The supervision of entire tract has been in my hands from 1888 to 1912. All special matters involving expenditure of money or anything else were passed by general manager to board of directors. I simply executed orders.

In 1888 when I went into superintendence of this Wheatland irrigation system there were constructed canals 1 and 2 and the tunnel from the Laramie to the Blue Grass; also all ditches and the tunnel appearing on Plaintiff's Exhibit A. The enterprise as then contemplated is shown, Exhibit A. There may be minor defects in location of ditches but general location given correctly. Lands intended to be reclaimed are correctly noted on Plaintiff's Exhibit A. My first duty superintendent was to reclaim as speedily as possible land shown on Exhibit A, which shows extent of then contemplated irrigation.

16 Subsequent to 1888 we enlarged tunnel from the Laramie to watershed of Blue Grass. This done on two different occasions, first about 1905 or '6, last about 1908 or '9. First enlargement work consisted principally in taking out material that had been working in for years at both ends of tunnel. That was about 1906. Slumping of material, combined with material never removed did not reduce tunnel to any extent. Purpose of enlargement was to increase flow of water through tunnel. The second enlargement (1908 or '9) consisted in lowering the tunnel through entire distance,

17 from a few inches to about two feet in different sections of tunnel. It consisted of blasting solid rock in floor of old tunnel.

A crib and rock dam (now gone) was in river at the Laramie river portal of the tunnel, when I was there in 1888. It was out

about 1895 or '6 through an ice jam and was replaced same spring. I put back same character of structure, which is still there. Neither dam of system has gone out within last two years. A portion of wasteway has washed away this year.

18 Raceway is ditch (400 or 500 feet long) leading from dam into mouth of tunnel. In 1888 we wasted water back into the Laramie at north portal of tunnel through an old wasteway. Now have wasteway in dam. In 1888 and since in wasting any excess of the capacity of the tunnel it went over the rock crib dam and down the river. Considerable leakage in old dam. If not repaired new dam leaks occasionally. In 1888 tunnel about one-half mile long. Big Laramie River at diversion dam (near the north portal of tunnel) is in a mountainous canyon, of Black Hills range. (Same range in which Laramie Peak is located.) From Laramie Peak mountain runs south and a little east, perhaps.

19 Union Pacific Railroad crosses this range at Sherman Hill. Continuous range from Sherman Hill to Laramie Peak. This general mountain range lies east of Laramie Plains. Diving line between Laramie Plains region and prairie region in vicinity of Wheatland. Also between prairie region in vicinity of Cheyenne, Iron Mountain and other similarly located places. River flows in these mountains about seven or eight miles before reaching diversion dam at tunnel portal. No Rocky Mountains east of this range of mountains. A number of streams head at west toe of this range and flow easterly. Pole Creek, Horse Creek, Chugwater and all small creeks I am acquainted with, head in Laramie Plains and flow easterly. Duck Creek and all those head in Laramie Plains and come into Laramie River.

21 Laramie river and its tributaries in Colorado and Laramie river and its tributaries, in the Laramie Plains region, flow, unless diverted, through canyon at tunnel portal. When I took charge in 1888, whole Wheatland or Wyoming Development Company system commenced at this diversion in canyon. After water had passed through tunnel, as then constructed, it flowed into the Blue Grass,—a natural waterway,—thence into the Sybille, thence down Sybille Creek, about a mile, to head of Canal No. 1

22 (Exhibit A). Some of the water then flowed down Sybille below the head of Canal No. 1, to Canal No. 2. (Plaintiff's Exhibit A.) We used natural water courses of Blue Grass and Sybille creeks as a part of our canal system.

Entire system as then contemplated is shown on this Exhibit A. Settlement did not commence until about 1894 or '5 in vicinity of Wheatland. About 1893 or '5 L. W. Gray acted as Immigration and Settlement Agent for the Company, for about five or six years and was succeeded by J. R. Mason. Their business was to bring farmers. With the exception of possibly one or two cases, when I

23 went in charge of system in 1888 there were no farmers who owned their land irrigating from this canal. In 1894 and '5 there were not very many, about same number as in 1888. Railroad had been constructed and was in operation during this time. After 1894 or '5 immigration continued. Cultivation of these



ands in Wheatland area has been increasing steadily ever since we started to bring in first settlers. Greatest settlement was in 1894 or '6. Many of these farmers were drouth stricken and we then had them there farming and doing business. Record of contracts of sale between company and each farmer between 1893 to 1912, was kept in office of Wyoming Development Company at Cheyenne.

24 John Chaplin is its bookkeeper and secretary and treasurer.

Record of these contracts would be a correct determination of record of settlement of the area. During this time part of the contracts lapsed and the land was resold and passed into different hands and great many of them sold their contracts. Every time a contract was resold a new man came in. Then the list of contracts would include in a sense a duplication of sales. Only in cases of lapses or surrenders would a new contract issue. These sales were evidenced by contract providing for yearly payments.

25 Canal No. 2 was constructed in 1888. Plaintiff's Exhibit

A had been printed prior to 1888. Canal No. 3 is about half way between canal No. 1 and canal No. 2 on the Sybille. It heads in section 27, township 22 north, range 69 west. It was an afterthought conceived in years after I went in charge of the system, along about the time we began to bring in settlers, '96 or '7. Shortage of water caused its construction, also for catching flood waters of Laramie river. Our ditches would carry the water that came through the tunnel, but we were short of water at flood season the first two years. We tried to farm two years. We brought in a great many Colorado people and they told us we would have to do something and to do it quick. After the first of July our water went to nothing. So we agreed that reservoir site for No. 1 reservoir would be sufficient. No. 3 ditch was built to fill reservoir, about the

26 time we constructed No. 1 reservoir to conserve the flood waters. The intent was to use waters stored in No. 1 reservoir for better irrigation of original tract. It was not contemplated at the time I went in control in 1888. I will later give the date of the beginning of construction of this No. 2 canal and No. 1 reservoir. There are about thirty-five thousand to forty thousand acres out of the original sixty-five thousand acres now under irrigation and farming, I should say that at least twenty-five to thirty thousand acres of this amount was in irrigation in 1900.

27 A greater development occurred between 1895 and 1900.

I will produce the date on which the preliminary survey was begun on reservoir No. 2. No. 2 reservoir,—an afterthought—I think was completed about 1900. It was not considered before 1895. Scarcity of water for our people brought about its construction.

After the flood season we were short of water every year.

28 A desire to deliver water to our contract holders at the date they wanted it brought about the construction of this reservoir. It was called to our attention first in 1895. Funds were obtained for the construction of reservoirs No. 1 and 2 by advances from the contractors. They called a meeting and demanded of the company that they make some move to store more water. That deal was pulled through by an advance of \$2.50 an acre paid on the land

through the parties that held them at that time. Also an advance charge on all future sales. The company put up their portion of the money on the land not yet sold. They looked to future sales for their return. No. 2 reservoir is located on Laramie river,

29 townships 21 and 22, range 73, about sixteen miles above Laramie River portal of Wheatland tunnel, and across the river channel. It is made of earth, originally forty feet high, and was supposed to hold water from thirty-five to thirty-six feet in depth. Its safe impounding capacity in feet in depth from the bottom of the outlet tube would be about thirty feet. The dyke has settled

30 from the height to which it was built. There is a spillway at the extreme north end of the reservoir. At a point six or seven miles distant from the outlet tube, which point was originally intended as a spillway or wasteway. It was originally supposed to be a natural spillway at the northeast point of the lake where the spillway is now located. The main embankment on the river settled so that the spillway did not operate naturally. In 1909 when the lake was so full we let off the water wherever we could. I started a spillway that year with teams and horses, plowing out after the water got up where it looked a little dangerous. I sluiced out a

31 spillway at that point. There are four gates at the outlet tube at the river. These gates discharge their water into two tubes.

Each outlet tube has two control gates. These gates and tubes are located practically in the old channel of the Laramie river. Waters discharged from reservoir flow back into old channel of river. Gates are seven feet high and about four feet wide. The outlet tubes are constructed of rock masonry. They form two arches five by five.

In 1909, when the water was so high, they were raised to their

32 full height and were opened to their full carrying capacity. All of water we could possibly discharge through gates was going through these two arches. Water continued to rise in spite of that fact. It continued to rise in varying amounts over several days until we began to get the water out of the spillway. It rose three or four inches a day for at least eight or ten days. Even after we got the spillway operating it continued to rise for several days while the spillway was running water. The spillway was discharging water sixty feet wide and six or eight feet in depth. The water runs down

hill quite rapidly after leaving spillway. I mean the same.

33 At the time I speak of the spillway was an open cut in the earth. We had no trouble in controlling that from washing out. The water ran over spillway for thirty-five days several feet in depth. This occurred during latter part of June and first of July. During all of this time we had the gates clear up so as to give them the maximum discharge capacity. We did not break our dam in river. That was the first year water ever flowed over what was originally intended as a wasteway.

34 We had filled the reservoir on previous years to its full impounding capacity. But we had always used the discharge tubes or outlet tubes at the dam and the gates as our means of waste prior to that time. It has been our custom to use them from year to year whenever it was necessary. There were several years it was

not necessary to slough off much. The Laramie river fluctuates. There was perhaps one year prior to '99 that we had to use the gates. Those were kept open while the water was flowing into the lake from the river for eight or ten days. At one time we had them open to their full capacity for three days. That was the time the wind got to blowing on us. We would not necessarily have to do so but the wind got to blowing and cutting into the riprapping and we had to do that to cut it off. We kept reservoir full that year. I think we did not open the waste gates more than one occasion during that year. In other years it was our custom to keep the gates shut on this reservoir except in drawing for irrigation. We have never wasted

35 water down the river in the early spring or late winter for fear of ice injuring our dam. If so it was without my instructions. A very small amount of water has been leaking out of those gates all the time. There is not enough water in the river below the reservoir when the gates are shut down to protect the fish. The year following the big flood that I have mentioned we put in that spillway and added a new wing to it so that by water flowing through it by turning a little stream with a coffer dam on the platform, we extended our operation there. The flood of 1909 did not damage the dam just below the point of discharge at the tubes. A hole had been growing there for several years, the hole in the water had been eating in there, and after the State Engineer and some more

of them came out and demanded that we fix it we did so.

36 There is enough water coming into the Big Laramie river from springs and other sources between the reservoir and the diversion dam at the tunnel, for domestic purposes throughout the winter. These springs were there before our reservoir was constructed. No noticeable return seepage on account of the construction of the reservoir. There are one or two small ranches at this spillway and they still call for their irrigation water. It doesn't seem to have interfered with their hay lands down there. Some of the water which flows down to the tunnel from leakage, springs and other sources during the winter months when we are not irrigating at Wheatland, goes down the Blue Grass, through the tunnel, and we use it in Reservoir No. 1 ditch. That ditch is canal No. 3. We aim to keep that running all winter. No water leaks through the dam at low stages. The tunnel is so constructed that it draws water from the main river without the necessity of a diversion dam at low stages. No telephone to this reservoir from Wheatland. We have

had a telephone from two or three years at the reservoir  
37 house. We have a keeper at the reservoir. He is supposed to stay there twelve months in the year. Prior to the last two or three years nearest telephone was at McGill's ranch. It is about two and a half miles distant. It is our custom to have our ditch riders watch the water supply and to order from the reservoir as needed. The man at the reservoir does not operate on one order given at the beginning of the season. During winter he reports one to three times a month on the condition of the reservoir and the condition of everything in general. During the time we could get through with teams it is safe to say that from the time that reservoir

was built I was there at least during the irrigation months two to four times every month personally. My ditch rider would be there if there was a scarcity of water to regulate it. They were there two or three times a week. If we were running water in sections, which we had to do occasionally, we kept one man on the road constantly.

38 The reservoir marked on map Exhibit A attached to answer of Greely Poudre Irrigation District as the Wheatland Reservoir is this reservoir No. 2. The water has been delivered from this reservoir as demanded for the last number of years. Prior to that when our canals and laterals were in shape I ran water as soon as they needed it.

39 We do not obtain any water from Sybille Creek after a few days of high water in the spring, without there was a cloudburst. The Sybille is of considerable drainage and has a constant flow. The Blue Grass flows water naturally, a small amount, the other tributaries of the Sybille coming in above the Blue Grass all have a constant flow of some kind. Heavy rains produce a rise for a few hours in the Sybille creek. Sometimes we divert this water into our system, but very often, our ditch is set and it goes down the creek. Those are very uncertain, but sometimes we are fortunate enough to benefit by it. The water we do not catch goes to the Laramie river.

This entire system as finally completed at the time we completed the Reservoir No. 2 we use for the reclamation as near as we could of this original tract. The entire tract was not brought under irrigation and actual farming because there was quite a parcel of land sold to parties held for speculation and we were unable to control it and it is still in that condition. I could not state what portion of the original tract the development company owned at the time I left it in June 1912. All the time that I was with the company we had been working to reclaim this acreage contained in the original tract.

The Bordeaux tract was conceived for development somewhere about 1908 or 1909. The Sybille or Cooney Hill tract some two years later was started. The Bordeaux tract will be reclaimed through extension of No. 1 canal. The Sybille or Cooney Hill tract will be irrigated out of the canal taken directly from the Blue Grass creek. This is a new and independent canal taking water from the Blue Grass before it reaches the Sybille creek. The Sybille tract lies across the Sybille west of the original tract. They are about at the same elevation as the lands contained in the original tract.

41 The Bordeaux tract lies south and east of the original tract. In order to reach the Bordeaux tract it was necessary to build a tunnel to carry the water of No. 1 canal to that tract. There is a hill lying between the original tract and the Bordeaux tract through which the tunnel is made. The tunnel is constructed in sand rock.

This Bordeaux tract is a separate and a new tract of land added recently. We contemplate irrigating it through the No. 1 canal. We enlarged No. 1 canal for that purpose. The tunnel was deepened in later years and an enlargement of No. 1 canal was made for the

purpose of obtaining an additional water for the Bordeaux and Sybille tracts.

42 These two tracts were not in contemplation when I went in charge of the system in 1888 nor when we constructed our reservoir No. 2 in 1900.

We carried over a small quantity of water during the winter in reservoir No. 2 every year since it was built, but only two or three years any great quantity. There were at least two years that we drew practically every drop off that we had in storage. The total capacity of reservoir No. 2 is supposed to be 126,000 acre feet approximately. When we held water over we had more than enough to meet the demands of all needing water on our project. After that

43 service we had water not used. During one season of high water we held over as much as one-fourth of the original amount. About 30,000 acre feet. On another year about 10,000 acre feet. Other years from eight to ten thousand acre feet. On other years some small amount. During our administration we did not have any record from year to year or month to month showing the gauge height depth of water in reservoir No. 2.

44 Examination by Mr. Charles F. Tew:

I ceased connection with the enterprise in 1912. We have not filled the Wheatland reservoir irrespective of storage in James Lake and Hattie Lake as we formerly did and emptied it for the irrigation of Wheatland project every year. We did not stop them from taking water, but we complained. During 1912 we stopped them from drawing water.

45 I know from hearsay that James Lake was filled at the beginning of the irrigation season of 1913. I heard they had considerable water in Hattie Lake. I do not think the Wheatland reservoir was filled that year. When at full capacity the water stands above the wasteway gates. If the wasteway had not  
46 been obstructed it would have flowed over the wasteway in 1912. It was this full notwithstanding the taking of water for those two large new reservoirs. From the year 1909 to the year 1913, inclusive, under our works we served full area of about 35,000 acres.

47 Cross-examination by Mr. Delph E. Carpenter:

I would like to have the record show more accurately the discharge from the wasteway out of No. 2 reservoir, during 1909. The water ran over the wasteway for thirty-five days, starting at a few inches in depth and increasing until the last few days, and ran the depth as stated in my former testimony. The hole that was washed in the wasteway kept increasing and I think perhaps the last three or four days before the river began to fail the volumes lowered about as I stated in my former testimony. Then it continued down until it finally stopped. When at its maximum it was about sixty feet

48 wide and six feet in depth. That was in 1909. During all this time we had the outlet gates at the dam open and were discharging water at their full capacity. This reservoir was

completed July 1901. It was located October 1894; the first payment appearing on the company's books, being October 31, 1894, for the expenses for the general manager and the engineer; surveyed and plats made prior to September 11, 1895, the company's books showing a payment of \$221 to Clarence T. Johnston, an engineer, for making the survey on that date; application for permit was filed January 29, 1898; actual construction work commenced June, 1899, and the reservoir completed July 1901.

49 This information is from the books of the Wyoming Development Company, and is within my personal knowledge. Canal No. 3, work of construction commenced June 1, 1894; completed May 10, 1895; no record of the date of survey; Reservoir No. 1, construction work commenced March 1897; completed May, 1897; permit issued May 7, 1897, from the State Engineer. No record of date of survey. The caretakers of the No. 2. reservoir were:—1901, Tom Graves, now dead; 1902, Merrill Waitman, now dead; 1903 to 1907 inclusive, Jess Reed, now living in Montana; 1908 and 1909, Frank Wickham, now in the employ of the Swan Land and Cattle Company; 1910 to now, Leo Sheldon, whose address is McGill. The year in which the second greatest amount of water was stored in Reservoir No. 2 and when the gates were open to permit its discharge was June, 1907. June 1, 1912, the acreage of land in the original project which had been sold, exclusive of cancellation, 30,453.36 acres.

No. 2 reservoir was located with J. A. Johnston during 1894 and engineer MacFarland. Clarence Johnston made his survey later. The first survey was made by MacFarland and verified by Clarence

P. Johnston. Clarence P. Johnston did not have supervision  
50 of the construction work. Work of construction began in June, 1899, and continued constantly until the work was completed. The contractor was Shaw, from Omaha. The dam and rip rapping were all completed July 1901. Water was impounded immediately thereafter. It was used for irrigation. A very small amount was impounded the first year. In 1902 we were short of water. We had some winter accumulation in the reservoir. Also

51 from flood flow in the spring. The year 1903 was an average year. The gates were shut down from fall of 1902 until we began to irrigate in the spring of 1903. In the spring of 1903 we did not avoid impounding the full capacity of this reservoir as a precautionary measure to avoid any possible breakage. We carried over a small amount of water after the irrigation was completed for the summer of 1903. There was a fair supply of water for 1904. We never wasted any water during those years. We carried over a small amount of water after the summer irrigation in 1904. We were short of water in 1905. I think we were short in 1905.

52 The present manager, J. A. Elliott, who is present, can give you the data regarding the last few years. We carried some water over in the fall of 1905, also in 1906. In 1907 we had an abundance of water. That is when we had our outlet gates raised for preventing further filling of the lake for a few days. The water was about five feet from the top of the embankment when the



53 water was at the high water line. We had a freeboard of  
five feet of embankment above the high water line. I do  
not think the present dam has settled since 1907. I think  
it had stopped by the years 1906 and 1907. I do not think the  
water rose in the reservoir in 1907 after we opened the outlet gates.  
Water was flowing into the reservoir from the river when it was being  
discharged through the gates. We carried over a good supply of  
54 water, larger than usual, after the irrigation during the  
summer of 1907.

No. 2 reservoir consists of two basins with a narrow neck  
between the two. The easterly basin was used in the first years of  
the use of the reservoir. Between the reservoirs we have been doing  
some excavating during different seasons when the water was  
55 low in the fall. There is several feet of water left in the east  
basin which we cannot draw off. We had a fair supply of  
water in 1908. I do not believe we filled the reservoir as full as we  
did in 1907. It was somewhere nearly as full as in the spring of  
1913. There is a stage when safety will forbid the further filling.  
It held in 1907 and 1909. We had a number of men and appliances  
there awaiting the break in 1909. It is an earth fill, the rip rapping  
is of stone laid loose. No concrete under the rip rapping. The  
loose rock rip-rapping was obtained from the surrounding  
56 country. It was laid on by hand. In 1909 we took an addi-  
tional precaution to prevent the dam from breaking. We  
carried over a small amount of water from 1908. That spring we  
had the reservoir prtty well filled, but I cannot state definitely whether  
another foot would have filled the reservoir in 1908 to its stage in  
1907. That is a reasonable approximation, somewhere along there.  
In 1908 and '9, there was a very full supply of water and 1909 was  
the year of our battle with the water to keep from destroying the  
reservoir. From 1901 to and including 1909, water was run-  
57 ning into the reservoir when we were drawing it out for irri-  
gation. The inlet capacity to this reservoir is limited only  
by the capacity of the river. The amount of the discharge is regu-  
lated by our will. After the reservoir has been filled then we raise  
the gates for the waste. No water went over the wasteway during  
1908. In the fall of 1909, after irrigating, we had a good  
58 supply of water that we carried over, about 30,000 acre feet.  
We did not carry water over in the fall of 1910. In 1911  
we were short of water. We did not carry over any water in the  
fall of 1911. That year we drew out of the reservoir all the water.

We practically drew all of the water from the reservoir dur-  
59 ing 1902 and 1903. During the early stages of its use. In  
1911 we drew the reservoir dry. I believe 1902, 1903 and  
1911 were all notoriously dry years. In this reservoir we have ex-  
perienced the extremes, from the very driest of seasons to the very  
wet season of 1909. In 1912 the reservoir was practically full to  
the safety margin. I don't think we wasted any water in 1912. I  
ceased active service as superintendent in June 1912. I am fa-



60 miliar nevertheless with conditions during 1912. From 1901 to 1913, I would say that the spillway was used only during the season of 1909. The capacity of Reservoir No. 2 was computed by our engineers at 126,000 acre feet. I believe Reservoir No. 1 covers about 340 acres.

61 In 1908 or 1909 the rock was blasted out and this tunnel deepened from a few inches to a few feet. J. A. Elliott was in personal supervision of the work. Canal No. 1 was enlarged and the tunnel deepened the same season. The enlargement of the tunnel and the capacity of Canal No. 1 were for supplying water to the Bordeaux and Sybille tracts. The enlargement of Canal No. 1 was for carrying water for the Bordeaux tract and for supplying the original tract.

62 The capacity of the tunnel and raceway since enlargement and deepening is about 770 cubic feet per second.

It was the custom of the company to have the reservoir gates at Reservoir No. 2 closed when there was a heavy flow of water in Sybille creek. Once we depended entirely upon the Sybille

63 for our supply. Outside of a few days in the early part of

April or May perhaps, there is very little water available in Sybille creek. The snows on the Laramie mountains melt away very quickly and during the months of April and May the melting causes a flow in the Sybille and its tributaries. The Sybille springs form a constant source of supply to Sybille creek. The melting snows and springs make an early spring flow except in years of no snowfall. This water flows into the Laramie river. We take it into No. 1 reservoir. Since we constructed No. 3 canal, we have always diverted out of the creek into the canal and never allowed any to do to the river. We have used that to fill No. 1 reservoir. During heavy summer rains the Sybille and Blue Grass and tributaries have heavy flows of short duration. It is our custom to  
64 direct all water we can, not only into our ditches, but into reservoir No. 1. What we cannot divert into canals numbers 1 and 2, and canal No. 3 or reservoir No. 1, goes into the Laramie river for appropriators there.

There is water flowing at Uva all the time. The North Laramie river has a small constant flow at its mouth. This flow comes largely from return waters from irrigation up the valley of the North Laramie. The valley of the North Laramie varies in width from half a mile to a mile. It is used principally for hay meadows. There are one or two large irrigation projects higher up on the North Laramie. The projects are on the bench land adjoining the North Laramie river. These projects have no connection with and are in no ways operated by the Wyoming Development Company.

65 Governor Carey is in no way interested in this project.

Other than this larger project, the irrigation on the North Laramie is quite similar to that in the Big Laramie river valley between the Wyoming Development Company tunnel and Fort Laramie. There is a constant flow of water in the Big Laramie river at Uva and below that point. There is a certain amount of return water flowing in the Big Laramie river from the mouth of the

Sybillie to the mouth of the Chugwater. That is natural seepage from the heavy irrigation on the flats near Wheatland. It also adds to the supply of water in the Big Laramie river. The flow is constant.

In 1905 water flowed in the Sybillie Creek until the 10th day of July. In two or three other years the water flowed in Sybillie creek in a limited amount up until the first to the tenth of July. That creek furnishes a limited amount of water for our system.

66 It has occasionally happened that the company has permitted the water diverted from the Laramie river to flow down the Sybillie Creek and back into the river, when not required by the users on the Wheatland flats. We have not wasted water out of the lower ends of our canals with perhaps one or two exceptions. It has not been our custom to order the caretaker at the reservoir to turn out what in our judgment would be amply sufficient to supply our customers, and to turn the balance of the water down the Sybillie. It has been our custom to waste water down the Sybillie only in case of high water. We do not figure any waste from our system. If on August 8, 1913, 24 cubic feet of water per second of time was passing from the Sybillie into the Laramie river, that water must have come from flood waters or some break or damage in the ditch. If on August 8, 19 cubic feet of water per second of time was flowing in Sybillie creek immediately below No. 2 headgate, that would indicate that water was being wasted down the Sybillie creek. I

67 think that is rather unusual in the distribution of water from our system. The irrigation on the Sybillie above our headgates to canal No. 1 is confined to the irrigation of little strips of land on either side of the creek by the ranchmen up in the mountain districts. The same is true of the Blue Grass and other tributaries.

The Sybillie tract is supplied from Blue Grass creek, the ditch is not yet completed. The Bordeaux track is supplied by a continuation of No. 1 canal, the upper line, which passes through a ridge by means of a tunnel and around the Bordeaux tract. The Bordeaux tract is about the same soil as the original tract, but it does not lie so nicely for irrigation. The bulk of it is very uneven, and traversed

68 by many draws and waterways. Some of that soil is decomposed brule clay, but there is quite a per cent of first class land on the tract. The Sybillie tract, for agricultural value, compared with the original tract, does not come up to the standard as a whole. I prefer the Sybillie tract to the Bordeaux, from an agricultural standpoint. The southerly portion of the Sybillie tract is quite rolling. The best land in the Sybillie tract is at the extreme north and central part. Some good agricultural land there. The original Wheatland tract was comparatively uniform and easy to irrigate. Both of these new tracts are difficult of irrigation as a whole. The net irrigable and tillable acreage of the new tract, will be much smaller than that of the original

69 tract. Out of the original 60,000 acres in the original tract about 30,000 acres are under cultivation and irrigation. The tract is about fifty per cent under cultivation. The project was

commenced in 1883, so that thirty years have been consumed. During that thirty years, fifty per cent of the total acreage has been reclaimed. Out of the remaining thirty thousand acres some small per cent is not irrigable. Some of the outlying sections are a little rough and broken. At the places where the flats break over into the drainage channel. Very little of the remaining thirty thousand

70      acres is above water and too high to be reached. At least eighty or ninety per cent of the remaining thirty thousand acres can be made into irrigable agricultural land.

The most desirable out of the original 60,000 acres was first selected by settlers when buying. Those lands now under irrigation are the most uniform. I previously stated that about 25,000 acres was irrigated in 1900. I desire to correct that by stating that about 10,000 acres was irrigated that year. 1894 or -5 about two thousand acres of the original tract were under irrigation. Only about one

71      thousand acres were farmed prior to 1895. From 1895 to 1900 we had an increase of about nine thousand acres in farmed irrigated land. There has been a proportionately small increase of irrigated cultivated land since 1910 or 1911. The real active development began about twelve years after we had commenced work. The latter part of one season and during part of another season in 1889 or 1890 no water was taken through ditch No. 1. We were taking water through ditch No. 2 during those seasons. We were not taking water through ditch No. 1, because one of our large flumes went out. The flumes went out over Deadhead creek.

72      Except for those times we supplied water through those two ditches continuously. Water then may have been wasted through the laterals for a few days at a time, but we did not make a practice of it. The beginning of active irrigation in the

73      Wheatland project varies according to the season, from the first to the middle of May. As a usual thing the heavy part of the irrigation started from the first of June on through the middle of July. The demand for water ceases about the middle of September. They cease irrigation on young alfalfa and that class of crops. It may be true that in the year 1899 water was turned into the canals of the Wyoming Development Company at Wheatland June 11th and that a little was used for irrigation before June 20th.

74      Alfalfa requires the greatest volume of water. The irrigation of alfalfa commences the fore part of June. The time of the heaviest irrigation is a matter of practice among various farmers. Usually we commenced irrigation of alfalfa for the first time from the middle to the 20th of May. To secure three crops, we figured on harvesting the first crop the latter part of June, as a general thing, and it takes about thirty days. As a general rule we only have cut two crops of alfalfa each year. The irrigation of alfalfa varies. We have successful farmers who irrigate their alfalfa two times to each crop. We have others who irrigate once to each crop.

75      It depends very often on the locality and the difference in the ground. They could produce good crops on much of the land there with an irrigation to each crop. The demand

for water diminishes about the 7th of August. The demand is undoubtedly much smaller the latter part of August and fore part of September than it was in June or July. Clarence P. Johnston was not in error when he said in the same Bulletin and on the same page "from the 12th of June to the 7th of August, the alfalfa was irrigated three times or more." Oats are irrigated from one to three times, according to the season and the nature of the land. In the earlier stages of our development we required more water to produce a crop. The duty of water on the Wheatland tract has been gradually increasing. The production of alfalfa on the Wheatland area varies with the season.

- 76 The average production for the first cutting for good farmers would be from a ton to a ton and a half. Over the whole tract about a ton per acre would probably come nearer the general average. The second cutting would not average so much. It would probably be a little in excess of three-fourths of a ton per acre. If the farmer is figuring on three cuttings he would cut his first crop from the 20th of June to the first of July. His second cutting the last days of July, but if they figure on only two cutting- he will let his alfalfa stand a little longer into August. For hay of the greatest strength and best condition they cut but two cuttings per year on the Wheatland area. Their second cutting would be about
- 77 the middle of August. Under the general rule of two cuttings a year, the third growth makes very good pasturage and is used for forage. It is used in the same manner and makes about the same growth as the fourth growth of alfalfa in the Poudre valley. About 1900 I bought considerable hay paying from \$3.50 to \$5 a ton in stack. Later years hay has been generally selling much higher. Higher prices for that class of hay have been generally prevalent throughout the west for the last few years. Within
- 78 the past few years the prevailing prices at Wheatland for baled alfalfa have been between eight and ten dollars a ton. That is f. o. b. car Wheatland. The prevailing price per ton for baling this hay is about a dollar and I would state that it costs about seventy-five cents per ton to transport the hay from the stackyards to the railroad track. The actual value of the hay in the stack would be obtained by deducting \$2.75 from the prevailing price of from eight to ten dollars a ton for the baled product delivered at the tracks. Baled alfalfa is of necessity the choicest of the crop.
- 79 Oats yield in the average season in the Wheatland area about fifty or sixty bushels per acre. They test about thirty-eight or forty pounds. We raise both winter and spring wheat. The growers, prefer the spring, and the millmen prefer the winter hard wheat. There is considerable of both varieties raised. Many of the farmers have raised as high as forty-five to fifty bushels per acre of spring and winter wheat both. Quite a few of the farmers have crops running from twenty to thirty bushels per acre. I would give forty-five to fifty bushels per acre, as the production, under the most favorable conditions with the best of farmers. The grain tests as a rule sixty pounds. There has been little corn raised in the Wheatland

area. I would guess that about twenty-five bushels to the acre would come nearer to the average of the better crops.

Our first frosts occur from the first to the tenth of September. The last ones from the first to the tenth of May. The river and creek bottom lands are most subject to frost. Frosts occur earlier in the fall on these lands. There have been seasons that frosts have come much earlier than I have stated in my first answer and much later in the spring.

I kept the records for the Weather Bureau at Wheatland for a number of years.

We have raised sugar beets to some extent during the past few years. We have had beets that ran into twenty-odd tons per acre. I believe 1911 was the first season when sugar beets were cultivated commercially at Wheatland.

I have raised potatoes myself on the Wheatland tract as high as one hundred and twenty-five to one hundred and fifty sacks to the acre. A sack will average one hundred and ten pounds. It is approximately two bushels in measurement. These crops I raised were under the highest state of cultivation. I cannot recall any crops over comparatively large areas which exceeded this production. The greatest acreage of potatoes that I produced in any one year in the Wheatland district was ten acres. The first crop I raised was on section 6, township 24, range 67. The next crop I raised was on the same land. I raised potatoes for several

years on section 12, township 24, range 68. The large yield I have spoken of came from that land on one or two occasions. In different seasons they were quite extensively cultivated, but there being no market stopped raising them for several years. Potatoes in our district have been afflicted with the blight. That blight has affected potatoes in all irrigated districts for the past few years. The crops mentioned are the principal crops produced in the Wheatland area in recent years. Small fruits grow in the Wheatland area very abundantly. Berries of all kinds. I have seen good crops of apples on young trees there for several seasons. We have made very creditable showings from the Wheatland district at different state fairs. It is still in its experimental stage. We do not raise peaches or pears. Cherries and plums do very well.

The elevation at Wheatland station is 4,738 feet.

In the Bordeaux tract about four hundred and fifty acres irrigated and cultivated during 1911. I do not think that there was as much as 1.067 acres irrigated in 1913. No land has been irrigated in the Sybille tract as yet. There is a small parcel of land in that tract irrigated from private ditch.

The population of Wheatland is something in excess of one thousand and there are considerably more than 1800 to 2000 people in the neighborhood outside of the town. The population of the district exceeds thirty-five hundred people.

## Cross-examination.

By Mr. Fred Farrar:

The company that developed this land at Wheatland is The Wyoming Development Company. The Wheatland Industrial Company is formed of the members of The Wyoming Development Company. It undertook the development of the Bordeaux tract, the Sybille tract and No. 2 reservoir. The two companies are distinct corporations. The original Wheatland tract was not a Carey Act, but a desert land project. There was considerable difficulty in securing the title. It was under the Stark's administration the troubles commenced, and we were delayed for a term of years owing to the Government Inspector's reports. There seemed to be a sentiment against us for a certain length of time. Finally the matter was taken up and a commission sent there. They reported favorably, in latter part of 1893. The 60,000 acres was patented at different times.

The Bordeaux tract is a Carey Act project. The Sybille is also a Carey Act project. No land has been patented in the Sybille tract. What I term reservoir No. 2 is on defendant's map designated as Wheatland reservoir. The water in this reservoir is impounded by a dam across the channel of the Laramie river. The water is impounded in two depressions off to the side of the river. The reservoir is about twelve to fourteen miles long. It includes at high water line some seven thousand acres. We have regulated the flow of the river at the reservoir according to the needs on the system. It has been our practice to impound all the water of the river until the reservoir was full, then we allowed the flow to pass through the reservoir gates. That water which was allowed to pass went down the river. If it was irrigation season we used it at the tunnel, otherwise allowed it to go down the Laramie river. We have gates at the mouth of our tunnel. We can intercept all the water in the river. If we need it for irrigation we take it through the tunnel and through this irrigation system. During the year since the Wheatland or Reservoir No. 2 has been constructed, we have had not only the amount of water impounded in this reservoir, which I have estimated to be 126,000 acre feet, but have also had the normal flow of the river. There have been no records until recently. The water drawn from this reservoir through a series of years was used for the irrigation of the Wheatland tract. None of it was allowed to go to waste. In 1909 we had high water which caused trouble at the reservoir. At that time the reservoir was filled to overflowing. I estimate we had 126,000 acre feet impounded. And in addition we had the flow of the river, which was above that of a normal year. Flood water was used for the irrigation of the Wheatland tract after the reservoir had returned to its normal state. During the time the excess water was passing down the river from the reservoir we were using it for irrigation. We had under cultivation that year close to the same acreage we have now, about 30,000 acres. 30,000 acres is the largest amount of land that has ever



- been irrigated under this system. Since the construction of the reservoir, we have had not only the reservoir, but the natural  
91 flow of the river to irrigate. The duty of water is the amount of land a given quantity of water will irrigate. We have in a general way an irrigation season at Wheatland. Without taking into consideration exceptional cases, the length of our irrigation season would be from ninety to one hundred days. The water is applied more or less constantly to the land for that period. Our practice is to irrigate, then discontinue and then later irrigate again. The amount of time water is actually applied would depend entirely on the different crops raised. We start in with alfalfa and  
92 apply the water to that first and follow on the grain crops and then change back to alfalfa. Many of the farmers on 80 acres, with their diversified crops practically use their water constantly. We ordinarily irrigate alfalfa for two crops about three times. It has been a practice among many of our farmers who have a large acreage in alfalfa, 80 or 100 acres, to start in with the water and keep irrigating until they went to harvest. As soon as they commenced to harvest that 80 acres they would apply the water and follow up right after the machine. On part of our land that amount of irrigation was necessary. We irrigate grain from  
93 one to three times. Our winter wheat is harvested along the early days of July. Winter wheat is generally irrigated once. Spring wheat is generally harvested about first of August. The irrigation of beets depends entirely on the season, many of them as high as four or five times. That irrigation continues after the irrigation on the other crops has ceased.
- 94 Since the construction of the tunnel and the diversion of water the authorities of Wyoming have not directed the amount of water which we could take. There was interference with our taking water only during 1911. We were notified to let water go down to parties below.
- 95 I know of the reservoir Lake Hattie. It is junior in appropriation to Wheatland Reservoir No. 2. I am acquainted with the reservoir on the Laramie Plains known as the James Lake. That is also junior to our reservoir. Lake James is a large reservoir.
- 96 I took charge of the Wheatland system in 1888. Then there was practically no land in the Wyoming Development tract in cultivation. During the early years of the history of the project and before there was any considerable amount of actual settlement the company itself put about 1,000 acres in actual crops each year. That was practiced several years before I commenced work for the company. At times during that period water from the ditches was turned on the prairie land. There was no cultivated  
land upon which to use it. That is not done today. That  
97 continued until they began to bring in settlers. The water was turned on the prairie lands for hay and pasture. In certain sections we cut hay and pastured and we rented our pastures to the stock men of that country at different times. We were in



effect merely irrigating the prairie lands for purpose of pasture. There were about thirty or forty thousand acres of this land irrigated. Ditches were constructed. Many laterals were constructed. The company continued to farm on this tract until 1894 or '95.

98 This water put on the prairie was applied primarily for pre-serving our water rights. Also to a certain extent to secure our titles under the desert land laws. These and the desire to derive a revenue from the pasture were the principal motives. There would have been pasture there without the water. Our actual settlement began in about 1894. There was a uniform price,—\$15.00 per acre,—for these lands, including the water rights appurtenant. The price gradually increased. We have different prices on different grades. When I left the company it was about \$60 per acre upon the better grades of land. That included the

99 water rights, unimproved land. After the settlement had progressed quite an amount of these land were abandoned. They reverted back to the company. In many cases the contracts were transferred to someone else. The lands marked abandoned on the map are those which reverted to the company. Several thousand acres of land are shown on the map and so marked. There were lands that were entered by purchasers and afterwards reverted to the company. I don't think the map correct. I don't think there was at any time in the history of the Development Company that number of acres in an abandoned condition. That map is an ex-

hibit of our company in a previous case. I have only a general knowledge whether the title to the original tract is taken

100 to the company or to individuals. The years when we began to settle our land, unfortunately, were the years following the extreme drouth through Nebraska, Kansas and eastern Colorado, and of course, after we acquired our title, like every other enterprise, we were anxious to sell lands. We sold regardless of the condition of the buyer. Our aim was to get in settlers, many coming without a dollar, from the drouth stricken districts, and the consequence was wherever there was one success there were many failures. The company assisted these people, but in the end many of them failed.

The wasteway at Reservoir No. 2 is at the northeast end of

101 the reservoir. No water is allowed intentionally to spill over the reservoir dam itself. Neither the company nor I have records of the amount of water taken out of the reservoir during the years since its construction.

Cross-examination by Mr. Delph E. Carpenter:

The company have not until recently used gauge rods or weirs. Up to that time we ran without any record. Defendant's exhibit No. 1 is a publication by the Wyoming Development Company.

102 Cross-examination by Mr. Fred Farrar:

The State Engineer compelled our company to draw water out of Reservoir No. 2 at different times on account of the amount of water we had in it. I believe during the high water season of

1909. Such an order was not given to me the year following or in the year possibly I discontinued my connection with the company.

Am familiar in a general way with the lands along Laramie river from our diversion dam to mouth of river testified to by Mr. Whitney. They are the usual class of our bottom lands all over the state. They are different from the uplands. Hay is natural in certain places to those bottom lands. In other places it requires

103 irrigation. They are commonly called native hay meadows.

Generally the ranchmen owning these meadows have reclaimed them as hay meadows. For the reason that the hay which can be produced on them is a profitable crop.

Reservoir No. 1 was intended to be filled with flood waters from Sybille creek. Lake No. 2 lies northwest of Wheatland. It is not a storage reservoir. It derives its water from No. 2 canal and partially from seepage. Surface water to a certain extent. Sybille creek is approximately 50 or 60 miles in length. Chugwater is somewhat longer than Sybille. I hardly think the greater portion of the cultivated lands on the Wheatland tract is devoted to alfalfa.

104 They raise a large amount of grain there each year. I think the list of irrigated lands that Hadsell prepared some three or four years ago was correct. That was for 1910. I believe there were several lists prepared prior to 1910 but I cannot say whether there was any record kept of them. There is considerable

105 land in the Wheatland tract farmed by renters and land farmed by the owners.

There has been no marked increase in the land farmed in the lower Laramie valley, during the last twenty years and no marked change in the population in that region. The increase has come almost entirely around Wheatland.

There is meadow farming,—ranching—on Sybille creek similar to that carried on on the Big Laramie, both above and below our headgate to canal No. 1. There is considerable more farming  
106 on the Sybille now than there was twenty years ago. There is quite a considerable being done above the headgate to ditch No. 1. Up in the mountainous district, and on the headwaters of the Sybille, the conditions are practically the same as they were twenty years ago. That territory is devoted entirely to the stock business.

There were various reasons which caused the trouble in our desert land entries. Many people were aiding the administration against us. People on the head of the Sybille

107 We had some opposition from the cattle interests. At that time 640 acres was the largest amount of land that could be taken up by one entryman.

108 The surveys for the Bordeaux ditch commenced on February, 1904, the construction in June, 1907. The ditch was completed in June, 1908. The surveys for the Sybille ditch were commenced in August, 1907; construction work in July, 1910.

## 109 Cross-examination by Mr. Delph E. Carpenter:

Clarence P. Johnston made the first survey of Bordeaux tract in 1904. The surveys made under supervision of Governor Carey. Companies took up seriously the consideration of the irrigation of the Bordeaux tract some two or three years perhaps after 1904. The first survey made by Mr. Johnston was for the preliminary line. It was to ascertain whether the project was feasible. The Bordeaux tract and its development was taken up in earnest for actual construction according to the company's books in 1907. I do not believe that surveys were made that year and construction was begun and that the engineer then went over to the work and began to work on the survey for the Sybille tract.

110 Engineering work was carried on on these two tracts during those years. In one instance the actual construction followed the permanent survey of that year, and in another instance the preliminary survey began.

## Redirect-examination by Mr. Clark:

111 In giving the capacity of reservoir No. 2, I am referring to the original engineer's notes of its capacity. Have no knowledge myself of its capacity.

We had the distributing ditches No. 1 and No. 2 filled to their capacity before any work was done on the tunnel. Filled them from water taken through the tunnel. The present supply ditch to the tunnel was constructed the same time the tunnel floor was lowered. It is not the original supply ditch. The headgate of the new race-way is from a quarter to half a mile from the head-gate of the old. The fall in that distance is quite heavy.

112 A new diversion dam at this new race-way across the river was constructed at the same time, of about the same character as the old one at the old race-way. Failure to colonize from 1888 to 1894 was caused by the difficulty in securing titles from the Interior Department. The high water in 1909 was exceptional. Never knew of any flow to compared with it, before or since. In 1907 we wasted water at the dam as a precautionary measure. The winds were blowing from the east and the dam was settling unevenly and the ripping was not setting as it should, and it became unsafe.

113 Think some of the wasted water in 1907 went through our tunnel and some down the river. In 1909 it largely went down the river. These were the only times water went down the stream except when there was an accident and we were repairing breaks.

Since constructing Reservoir No. 2 we have quite frequently had trouble with lower appropriators demanding water.

All the streams mentioned by me as having a continuous flow vary from time to time as to quantity. I was present when Reservoir No 2 was located at its present site in 1894.

114 The settlers under our canals had held meetings and offered to increase the price to be paid us per acre under their contracts if we would build the reservoir. At that time there were

2,000 acres under cultivation. There had been difficulty in securing water enough for the 2,000 acres. We were in position to divert and had been diverting all the natural flow of the river. Prior to constructing Reservoir No. 2 we ran short of water the first of July in some seasons, and from the middle of July on in some years.

We worked on the cut connecting the two portions of the reservoir in the fall of 1902 and 1903. The water in the reservoir was all drawn off those years.

115 Prior to constructing Reservoir 2, our source of water supply was the direct flow of the river. No. 2 was built to conserve the flood waters. In the early part of the season we sti' divert the natural flow of the river. No. 2 furnishes a supplementary supply for the Wheatland lands, and is the only supply for the Bordeaux and Sybille projects.

116 There is considerable seepage water from the Wheatland flats into the Sybille and also into the Chugwater and the Laramie river.

The map Exhibit A with the bill is generally correct.

The North Laramie river is correct on the map. It flows through the Black Hills and is a tributary of the Laramie. The map correctly shows the Sybille.

117 Duck Creek is correctly shown on the map. It flows into the river below our tunnel.

Cross-examination by Mr. Farrar:

117 By the Laramie Plains I mean that part of the country lying west and south of the Black Hill range. It includes not only the plain country but the mountainous country, it borders up on the foothills of the Black Hills range. The North Laramie heads on Laramie Plains.

118 Further cross-examination by Mr. Delph E. Carpenter:

Referring to Exhibit A and particularly to that portion in heavy blue in the vicinity of Wheatland which is designated as irrigated land, that part of the plat is in error as showing that all of the tract is irrigated, when only about fifty per cent of it is actually irrigated.

119 J. M. WHITNEY, a witness in behalf of Complainant.

Direct examination by Mr. Clark:

I have lived in Wheatland and vicinity since the spring of 1880. Live about 25 miles below the Wyoming Development Company's dam, and about 25 miles from the mouth of the Laramie. Have been familiar with the irrigation from the Company's ditches.

Know Cross T. Ditch No. 2.

120 I own that ditch. It diverts water from the Laramie River due north from Wheatland and was built before I came to that country. Has always been used to irrigate 318 acres for me and 150 acres of Ralston's land. Ralston commenced to irrigate in 1884. The ditch has sufficient capacity. Know the Scissors Ditch. It was

constructed before I came, was running water when I came. Takes its water from the Laramie ten miles below my ditch.

121 Irrigates more than 250 acres. Tolland Company owns it. Know Laramie Ditch No. 1 owned by Mullins & Bradley. It was running water in 1881. Takes water from Laramie River two and a half miles below my ditch. Irrigates 800 acres. They have since changed the line.

122 Know Cross T. Ditch No. 1 owned by Osgood Johnson. Diverts water from the Laramie three-fourths of a mile above my ditch. It was constructed about '84 or '85. Irrigates 90 to 100 acres.

The ditch of James Gallagher is taken from the Laramie and was built about 1890.

Know ditches of A. N. Spencer. They are further up. 123 And below the Development Company's dam. They were constructed about 1890. Know Bright & Sutherland Ditch which takes water from the Laramie east of the Tolland Company ditch. Built about 1890. The ditch has carried water regularly since. Carmichael & Gallagher also constructed a ditch about 1890.

124 The Cramer ditch takes water from the Laramie further up towards the Development Company's dam.

Reitz No. 1 and Reitz No. 2 are ditches built in the early 1890's. Know Thompson Enlargement to Scissors ditch. That was built in the early 1890's.

125 Know the Phillips ditch. It diverts water just below Uva. Built in 1890. Irrigates 30 or 40 acres. Uva ditch owned by Tolland Company. Built in 1890.

126 Irrigates 200 acres.

The Wyoming Development Company has taken at its dam in some years the whole flow of the river.

#### Cross-examination by Mr. Delph E. Carpenter:

126 Have lived in Wheatland seven years last spring. Before that lived on Laramie River, just above mouth of North Laramie. Ralston's ranch is at mouth of North Laramie. Some of his land is irrigated from Cross Ditch No. 2. Between 1880 and 1891, I was employed by a Cattle Company. Was manager for it in store and hotel at Uva. Railroad was built through Uva in 1887. Store prior to 1887 at old Uva, at present wagon bridge over Laramie River. Cattle business was then general business of ranches 128 in that country. From 1880 to 1887 Scissors ranch and other ranches were irrigating between Uva and Fort Laramie. Irrigation was along river bottom. Principal crop irrigated hay. Ranches then irrigated have been irrigated ever since for alfalfa and hay. Some now raising wheat, but hay principally. Between 1880 and '87 some irrigation at Uva on north side from North Laramie. Part of same still irrigated for hay. North Laramie tributary of Laramie River. Enters from north side. All ditches from Uva station to Fort Laramie are below mouth of North Laramie River.

129 Sybille and Chugwater enter Laramie river from south. Ranches from Uva to Fort Laramie below mouths of these streams. Cross T. Ditch No. 2 used for irrigation of about 318 acres since 1880, mostly to hay, some oats, some alfalfa. Land in valley of Laramie river on north side. Ralston has irrigated since 1884 about 150 acres from an extension of said Ditch No. 2. Principally hay, some oats, and some alfalfa.

130 Both my ranch and Ralston's ranch on river bottom. Probably from eight to ten feet to water under this land which lies at extreme limits probably three-fourths of mile from river, running from that width on irrigated area to narrow strip. Cross T. Ditch No. 1 of Osgood Dunton about three fourths of mile above my ditch and on south side of river, irrigating about 100 acres, built in 1884 and 1885. Crops irrigated principally hay and some oats. Object of owners of Ralston ranch, Osgood Johnson ranch and of my ranch in '80s was to raise crops for feeding stock. Of my 380 acres I broke 40 acres of sod for oats and alfalfa in about 1893. Prior to that it was in native hay.

131 Raised two crops of oats and seeded it to alfalfa second year. Never raised oats after that, just grew hay. Johnson, whose farm is under Cross T. ditch, plowed some of his land, putting about 20 acres of the 90 in oats and alfalfa. Next canal from Laramie river down stream is Tolland Cattle Company or Uva ditch. Neither of Cross T. Ditches divert water below mouth of North Laramie, nor obtain water from that stream. Of 200 acres under Uva ditch, constructed in '90s, part irrigated to native hay, and part in oats for several crops, then seeded to alfalfa. In latter

132 part of '90s they raised two or three crops of oats on 50 or 60 acres then seeded to alfalfa. Land in alfalfa ever since. This ditch takes water from Laramie below mouths of the North Laramie and Sybille, and above mouth of Chugwater. Tolland Cattle Company still in cattle business.

Next ditch down stream is owned by Yates, diverting water about three miles below Uva headgate on north side of stream irrigating about 100 acres. Constructed between '98 and 1900. Hay is principal crop. Has been put to same use as other ranches I mentioned. Dams of four canals of which I have spoken constructed principally of brush rock and small timber, called beaver dams, and

133 are of the character used by most small ditches along stream. Water flows over and through them. Are repaired from year to year as irrigation goes on.

134 Scissors ditch next down stream, about eight miles below Uva, constructed prior to 1880 and irrigates about 250 acres of river-bottom. This land extends about three-quarters of mile from bed of stream, lying in strip along floor of valley. Bluffs arise about it to north. In 1880 this land was cultivated to native hay. Its owners engaged in cattle business. This ditch located below mouth of Chugwater, gets benefit of North Laramie,

135 Sybille and Chugwater creeks.

McCormick & Bright ditch constructed in '90s next down



stream. Has dam similar to ones mentioned and irrigates approximately three or four hundred acres river-bottom in native hay and some alfalfa. So used since construction. Owners in stock  
 136 business. This canal gets benefit of North Laramie, Sybille, and Chugwater creeks, known as the Bright & Sutherland.

Next ditch about 5 miles down-stream is the Ryan. Constructed in early '90s, and used for irrigation of river-bottom. Not familiar with rest of ditches down stream. General character of irrigated land between there and Fort Laramie is river-bottom.

Lands irrigated from Uva to Fort Laramie generally river-bottom. This varies in width from half mile to mile. Country to north and south is hilly and used for pasture and is not irrigated, very little is susceptible of irrigation. Cattle pastured on this hilly land, wintered in river valley on hay raised on meadows mentioned.

137 Certain per cent of water diverted from Laramie by ditches mentioned returns to the river in immediate vicinity of meadows irrigated. Some evaporates. Would hardly think this valley was native hay meadows prior to white settlement. Underlying this meadow land is well defined water plane corresponding in a large measure with surface of Laramie river. Water runs in river between Uva and Fort Laramie year around.

138 Kept no record of flow at Uva station during years I lived there. Considerable meadow land irrigated on North Laramie above Uva. On main Laramie above Uva small ranches extend for probably 25 miles, used in same manner as ranches below Uva, generally producing native hay and alfalfa.

Mullin & Bradley ditch located next above diversion works of Cross T No. 1. Constructed in latter part of '70s.

Irrigates section or more. It is about three miles up stream on north side. They have raised oats there, but mostly native hay. Owners are engaged in cattle business.

Their lands extend about three miles along river valley. Ditch has same kind of headgate and dam as other ditches mentioned.

139 Native hay harvested about middle of August. Generally begin irrigating native hay about May 1st. Water is spread over land through lateral ditches and is kept flowing constantly. Same manner of irrigation practiced there as on upper Laramie river valley. Water turned off latter part of August. Some

140 cut hay and irrigate at same time. A few days required for meadow to dry so that machines can work.

These meadows vary, some don't produce much, and others produce about a ton per acre. The general hay meadows in that valley produce probably half ton per acre of native hay per year. Some of it does not produce on account of character of soil, and in some places they get too much water and in other places they can't get enough.

The land does not get enough water where it is not perfectly  
 141 true and uniform and where it undulates and rolls a little. In some portions the water accumulates in pools. Where this water accumulates it either kills the grass or causes slough grass to grow. This grass is not as good for hay as the native grass. It is



inferior but is usually cut. I include slough grass in my general tonnage production.

In Laramie valley in my vicinity we got two cuttings of alfalfa ear year. First about first week in July. Average alfalfa goes about ton per acre at first cutting. Usually of first class quality.  
142 Second cutting usually last week of August or first of September. Production a little less than first cutting, probably three-quarters of ton. Total per acre per annum of alfalfa about one and three-quarters tons. Begin irrigating alfalfa about May first. In irrigating alfalfa we keep water constantly in ditches and spread it on land in rotation. We stop irrigating alfalfa latter part of August.

Usually obtained about fifty pushels per acre of oats on land I cultivated, a fair average of production of oats on those ranches in Laramie Valley mentioned. Irrigation of oats begins latter part of June. Usually two irrigations. Harvested latter part of  
143 July. These conditions as to irrigation generally prevail in valley.

Combination ditch is next up stream, built in '90's. Irrigates river bottom on south side. Cannot give acreage. Same crops raised as on other ranches mentioned. Its diversion works similar to other ditches mentioned.

144 The Spencer ditches next. Constructed about 1885. Two cover about seven or eight hundred acres. River bottom on south side. Diversion works similar to others mentioned. Not acquainted above Spencer place, but know other ranchmen  
145 irrigate there.

The Laramie flows through mountainous country from where Wheatland Tunnel diverts water and there are no farms for a considerable distance along that portion of the stream. Ranches along Laramie River Valley east of the Laramie mountains and to Fort Laramie are similar and used for feeding grounds for livestock in the winter.

146 Prior to construction of Development Company's reservoir we had our principal flow in Laramie river in June, commencing latter part of May, and running into July. In irrigating meadows we spread water or otherwise we would ruin our meadows. In my own case I changed water every twenty-four hours. We usually carried strong head in ditches when available. Could  
147 get the water over meadows faster. When we were carrying these large heads of water greater portion of it running over meadows returned to the stream. The best native hay is not produced by keeping water circulating freely and as clearly continuously as possible across the meadows. Do not think any of the ranchmen up and down the valley changed their water often enough. Do not know how many cubic feet per second my ditch carries.

Cross-examination by Mr. Fred Farrar:

Water is turned off before the hay is cut. We generally irrigate native hay about three times each year, commencing first  
148 of May. My meadows have generally taken a week or ten days to irrigated. Second irrigation as soon as the water

was needed, which might be in a week or ten days or in two weeks. Third irrigation a little later. Each irrigation is distinct. I irrigated my alfalfa about twice to a cutting, commencing about May first, giving one good wetting in May and another in June.

Have cut oats two different years that went fifty bushels per acre. Had no other experience.

Have no measuring weir at head of my ditch but have headgate.

Other ditches mentioned have no weirs that I know of. Water  
149 is not measured. We take whatever we want. No restriction is put on us. I do not know capacity of my ditch, or that of any other mentioned.

Know company which projected this Wheatland enterprise but not connected with it. These ditches mentioned do not form part of Wheatland enterprise. They are small ditches averaging  
150 a mile or two in length, practically parallel to the stream and carrying no great distance. Irrigation of my native hay lasted about ten days. About two or three weeks between irrigations, during which time water was shut back into river. Cannot say whether that custom prevails up and down valley with reference to ditches mentioned. Other ranchmen irrigated their meadows similarly. Some have their ditches so arranged that the water flows through them when it is not used and back into stream, making constant diversion without any use of water.

Do not know of any regulation by Wyoming authorities of distribution of water among ditches mentioned. Each ditch owner allowed to take all the water he wanted. My neighbors and  
151 I have lived in harmony under that system. The general irrigation season on ranches mentioned commences about May. All told we use water about thirty days during irrigation season. We need it longer than thirty consecutive days and use it at periods all through summer.

My place at Uva about 5,000 feet in altitude. Cannot give character of soil under these river bottom lands. Never been large acreage of oats raised on ranches. They raise oats for their own consumption.

152 Cross-examination by Mr. Delph E. Carpenter:

Only small ranchmen, with exception of Tolland Company, located along Laramie valley from the mountains to Fort Laramie and through tracts mentioned. Have considerable area of country there. Ranch buildings probably every four or five miles. Domestic water for ranches acquired mostly from wells, supplied with water just beneath surface of land. Irrigate my alfalfa about same time that people irrigate alfalfa on the flats at Wheatland. Under Wheatland canal farmers irrigate alfalfa first time about latter part of  
153 May. On Wheatland flats chief business is farming. Up and down valley, near Uva, principal business is stock raising. Farming secondary matter.

154 J. A. ELLIOTT, a witness in behalf of Complainant.

Direct examination by Mr. John D. Clark:

I have been a civil engineer (irrigation) about six years Graduated at Cornell College, Iowa, in 1908. Have been Engineer and Superintendent for Wyoming Development Company since June, 1912. For a year and a half prior to that was engineer for that Company and from the fall of 1909 assistant engineer. Have known their irrigation system intimately since I first went there. Have superintended the running of the water and made measurements.

155 And supervised gauging stations on the river. Familiar with the amount of water in Laramie River and our tunnel and reservoir, and the amount drawn into supply canals and the use of the water. I had charge of the work of enlarging the tunnel. We began in the fall of 1910 and finished in the spring of 1911. The tunnel sides showed the high water line prior to the enlargement. That line was 18 inches to two feet from the top from a point 600 feet from the inlet, to the outlet.

156 That showed the capacity of the tunnel was limited by its intake. The enlargement commenced 200 feet below the portal. From there to the outlet we took out from two-tenths to two feet of the bottom of the tunnel with an average width of about eight feet. I don't think this work increased the capacity of the tunnel. If it did the increase was not over ten per cent. I estimate the capacity of the tunnel at 800 second feet. I do not know the capacity of the race-way.

157 From the outlet of No. 2 reservoir to the diversion dam is about 20 miles of river bottom. The tunnel is three-fifths of a mile long. From the tunnel to Blue Grass creek is about 1500 feet. From this point to the Sybille into which Blue Grass flows is fourteen miles. From that point to the head of Ditch No. 1, half a mile. From there to the head of Canal No. 3, six miles. From there to Canal No. 2, five miles.

The lands about the head of Ditch No. 1 constitute a low valley. The banks of the Sybille there are very low and sandy loam. No. 1 ditch follows the foothills. The flats irrigated by that canal are fifteen miles from the head-gate.

158 No 1 Canal is 35 miles long, flowing along the southern edge of the Wheatland flats, going within a mile and a half of Wheatland.

Canal No. 2 is 22 miles long and flows over the western and northern portions of the tract and through the town of Wheatland.

The Bordeaux ditch is taken out of Canal No. 1 about 22 miles from its head-gate.

159 No. 1 Canal has a capacity of 425 second feet. With a small amount of repair work it would carry 100 feet more. It has not been cleaned out for five or six years. In places it is filled from a foot to fifteen inches. Canal No. 2 is in the same condition. It has a capacity of 225 second feet. If repaired it would carry 75 feet more. The custom has been to run only what water was required.

160 We begin irrigating each year from the 4th of May to the latter part of May. Our last distribution is September 15. The ditches are run constantly from the beginning until August 15th after which the flow gradually decreases, except it is increased three or four days for beets.

Until August 15th it averages 550 to 575 second feet, although it has been as high as 650 for both canals.

If the supply is sufficient users receive their water constantly, and each does his own rotating between different parts of his land.

161 In three years since I have been there, 1910, 1911 and 1913, it has been necessary for the Company to apportion the water or rotate it among the users. 1909 and 1912 were the years since I have been there that that was not necessary. The Reservoir No. 2 covers 6690 acres. I do not have the contour lines. The dam is 40 feet high across the river, and there are five feet of a free board. The reservoir has not been filled to high water line since I have been there. This year was the highest.

162 This year we had seven feet free board, leaving two feet to high water line and 33 feet of water at the dam. Last year it was three to four feet below high water line. Since 1909 we have stored in the reservoir all the water that came down the Laramie River. During that period water has never been wasted down the river. During that period it has been our practice to divert at the tunnel all the water in the river with the exception of the winter time when we were doing work on the tunnel or diversion dam below or one of the canals. The water went past the diversion dam this year when we had a cloudburst between the reservoir and the tunnel. The water went entirely over the works at the tunnel, taking out about 30 feet of fill next to the head-gates.

163 The water going past when we were repairing came from small springs and streams between the reservoir and tunnel, the added flow from these being about 25 second feet.

164 In case of floods from local rains in the Sybille and vicinity which we have frequently in summer we run our ditches to capacity, not always intentionally. With that exception we never carry more water in our ditches than is used upon the land. We have never had any way of wasting out of the lower end of either of our canals.

165 We have two sand gates, one at the head of Canal No. 2 and another about 1500 feet down the canal. At these sand gates we aim to run from three to four second feet of water. Sometimes these gates become clogged with sand. We then open them up and perhaps twice as much water is run for a day or two until the sand is cut out. Then we almost close the gates. The water through these gates runs into the Sybille.

Such use of sand gates is necessary and usual. With this exception no water is in the Sybille below head-gate No. 2, except in case of heavy rains which are only temporary. The greatest flood flow in the Sybille at headgate of No. 1 is in the latter part of April and the fore part of May, and is over when we start our irrigation.

166 At times this flood is about 2,000 second feet. This is from cloud-burst and would last from two to six hours and

gradually decreases. In some springs the creeks come up to about half that amount and run for about a week. This spring we had no high water in the Sybille to speak of. After the spring flow the average run-off would be 6 or 7 second feet. In the winter the average run-off is 25 or 30 second feet. Reservoir No. 1 has a capacity of about 7,000 acre feet. It is filled by No. 3 canal which is about 12 miles long.

167 It is twelve feet wide on the bottom and designed to carry water three feet in depth. Capacity is 90 to 100 second feet. Banks slope one to one. Grade is 1.8 feet to the mile. Think we have five or six freshets each season on the Sybille. There is no way by which we can take advantage of this water during the few hours it runs. It is generally an injury rather than a benefit to the system. Except Reservoir No. 1 we have no way of storing water from the Sybille.

168 The total acreage irrigated in the Wheatland tract is 33,544 acres, in the Bordeaux tract, 1,004 acres. The Bordeaux tract covers 10,000 acres. The irrigation is by the settlers. 1,300 acres of the Bordeaux tract have been entered. It is a Carey Act project.

169 Lands in the Bordeaux tract were irrigated in 1909. I don't know what was done before that. The Sybille ditch was started after I went there. The main ditch is completed. It is 16 miles long. Laterals and siphons and the diversion at the head-gate are to be built. The main ditch is 18 feet wide on the bottom and designed to carry water four feet deep. Grade 2.6 feet to the mile. Capacity 300 second feet. 30,000 acres in the project. It is a Carey Act project.

170 The total water used by us in 1912 was about 100,000 acre feet of which 3,060 was used by the Bordeaux tract. We had that year about 40,000 acre feet left in Reservoir No. 2 at the close of the season. At the close of 1911 there was no water in the reservoir so that the amount stored in Reservoir No. 2 from the close of irrigation, 1911, to close of irrigation, 1912, was about 140,000 acre feet. This did not include all the water in the river just above the reservoir between these two dates that had not been permitted to flow down the river.

171 This year less water will be used because there is not so much water. Think the amount used in 1911 was not over 40,000 acre feet. Less than 100,000 acre feet was used in 1910. 1912 was an exceptionally wet year. There was a strong flow in all the streams the entire season. The present year is drier than the average. There are cases of farmers using water wastefully but the greater per cent of the farmers on the Wheatland lands use their water very economically. We had a few gaugings of the reservoir last summer and took gaugings three times a week this summer at the bridge six miles above the reservoir.

172 There are no additions to the stream between that bridge and the reservoir. During the winter months the average flow in the river would be about 90 second feet. The water begins to rise along in May. The crest of the high water is from the 10th

to the 20th of June. It reaches the low water stage the forepart of July. The average flow after that for this summer is about 50 second feet.

173 There is always a flow in the river at Uva. The North Laramie and the Dry Laramie are tributaries there. The Sybille enters the Laramie about ten miles above Uva. The Laramie at Uva has some flow from seepage from the Wheatland lands. There is some flow at Uva when all is taken at the Wyoming Development Company's tunnel. There is always some water in the North Laramie. There is a gauging station at McGill maintained by the state, and measurements by R. I. Meeker.

174 They were measurements independent of mine.

175 & 176 Cross-examination by Mr. Fred Farrar:

The average flow of the Sybille after the flood season is from six to seven cubic feet per second. The height of the high water on the Laramie river at the gauging station at the Iron Bridge was about the middle of June. It returned to the lowest stage in July. In 1913 it increased after that time. Of course last year was no criterion to go by. Last year, 1912, there was a constant flow during the whole season.

The bore of the tunnel diverting water from the Laramie River for the Wheatland enterprise, at the present time has an area of 72 feet. The grade from the intake of the tunnel to the outlet is 33 feet. For the entire distance, which is 2,985 feet. The bore was made by hand and machinery. In the fall of 1910 and the spring of 1911 the floor of the tunnel was deepened and an enlargement made. There is no cement or concrete lining in it at any place. The width varies and the height varies. This does not change the 72 feet area. I do not think that the cross-

177 section falls below 72 square feet. The grade of the tunnel is not uniform. Water stands at the lower end just at the outlet, about 34 feet from the lowest tunnel end. A pool of perhaps two feet in depth and 25 or 30 feet in length and the width of the tunnel is left there at that point. The new ditch from the

178 river to the tunnel was made in 1907. The dimensions and grade of the old ditch leading from the river to the tunnel are: the width on high water line is 37 feet; width three feet below high water line 33 feet; width on the bottom 22 feet; depth of water 5 feet; grade 0.57. Some 300 feet from the headgate the fall by actual level is 1.1 feet in this distance. A grade of 10 feet by the mile is shown by taking levels for 800 feet. The wasteway is 1,500 feet long. The present raceway was constructed in 1907. The

179 present raceway is a part of the old raceway. The diversion dam was moved down the stream from the head of the old raceway. At the present headgate in the new raceway the width is 25 feet. From there it converges until it reaches the mouth of the tunnel. At the tunnel it is the size of the tunnel, about nine and one-half feet on the bottom and about 11 feet wide, about 5 feet above the bottom of the tunnel. The high water line I think is



about 14 feet. From the headgate to the tunnel there is a grade of .5 feet. 250 feet below the headgate there is a point that is .5 feet higher than the headgate. Then from there down to the mouth of the tunnel there is a fall of one foot. The fall of .5 feet is from the headgate to the tunnel. The distance from the headgate to the tunnel is 450 feet.

180 The floor of the tunnel was lowered from a point about 135 feet inside the mouth of the tunnel, the lower end. This enlargement at the upper end I think was in 1907. The second enlargement I speak of was made in the fall of 1910 and the spring of 1911. Commencing at a point 135 feet from the upper portal the floor of the tunnel was lowered according to the dimensions I have just testified to. It was attempted to be lowered to the grade line shown on my profile. There may be variation of .2 of a foot above and in some instances a foot below the grade line.

181 There is a reverse grade for the first 200 feet. During the last two years there have been five or six freshets occasioned by cloud-bursts on the Sybille and Blue Grass. During those periods our ditches were bringing water from the Laramie river. They were filled from that stream. The water in excess of the remaining carrying capacity of the ditches went down the Sybille and into the Laramie river. Most of the flood water

182 was lost to our system. In 1913 we had high water on the Laramie for a period of about three hours owing to a cloud-burst between the tunnel and the reservoir. It covered only a small drainage area. This flood extended over to a small degree into the headwaters of the Blue Grass and the Sybille which are south of the river. The water was appreciably increased in these two streams at the same time. When this high water occurred in the river it went over our dam. We kept the gates to the reser-

183 voirs shut down at that time for a period of six to seven days. This high water on the Laramie river washed our part of our raceways. It took about 35 feet of the rock fill next to the headgate out. The dam we have in there is usually called a rock and crib dam. The water flowed over the dam for a period of probably two or three hours. I could not say the depth, perhaps two feet to two and a half feet across, the wasteway. The dam is about 12½ feet high. It is about 100 feet long on the bottom for that portion traversed by the flow of the river. The wasteway and the dam are the same thing. The wasteway is a rock filled crib, then the fills on either side I suppose would be considered as a dam too, and we ordinarily speak of the wasteway as the dam and the balance of it as the fills. The central portion of the dam as

184 to its length is where we have these rock cribs. The fill on the north end of this rock and crib dam or wasteway is made of dirt. The fill on the south end which connects onto the wasteway is loose rock. From the end of the fill on the north side of the headgate is 300 feet. Then from the headgate into the tunnel is probably 150 feet of filled material. The fill from the headgate to the tunnel for distance of 150 feet is part of the raceway. That



is what we call the raceway. We have a system of head-  
185 gates. These headgates which I mention are 450 feet from  
the tunnel at the upper end of the raceway. To describe  
the dam I will say that starting at the north end there is about 100  
feet of an earth fill. That joins on to the rock crib spillway, which  
is about 100 feet wide. Joining onto this there are sluice boards  
or a wasteway which is 14 feet wide. From this point to the head-  
gate, which is about 100 feet, is a rock fill. This joins onto the  
old raceway at this point. There is nothing between in the way of  
an outlet from the headgate to the mouth of the tunnel, along the  
raceway. The dirt fill is about 18 inches above the crest of the  
spillway. The spillway is about  $12\frac{1}{2}$  feet above the bottom of the  
sluice boards or wasteway and the rock fill from there on is about  
 $3\frac{1}{2}$  feet above the crest of the spillway. The sluiceway is where  
the sluice boards are in, 14 feet wide. The wasteway is 100 feet.  
The sluiceway is on the bottom of the channel in the rock crib  
dam. By wasteway I refer to the top of the rock crib dam itself.

The profile which I have does not show the line of the tunnel  
prior to 1907. The upper line of the profile is the top or  
187 roof. It is a fact that the 4 feet of increased depth was made  
in the floor of the tunnel immediately inside the upper portal.  
From the roof to the floor at the upper portal after the work of en-  
largement was done there would be a difference of 4 feet.

The flow of water in the winter months between the reservoir No.  
2 and the tunnel is diverted through the tunnel and used in No. 3  
ditch which flows into reservoir No. 1. None of this water is al-  
lowed to pass the tunnel, unless we are doing some construc-  
189 tion work on the ditches. At the iron bridge just above the  
reservoir there is a gauge with a chain which is let down  
from the top of the bridge, which gives the gauge height, and by  
reading this gauge height and taking actual gaugings with a meter  
at various times a rating table is formed, and the actual discharge is  
computed in this manner. The same method was pursued at the  
gauging station at McGill, between reservoir No. 2 and the tunnel.  
There is an automatic register there at the iron bridge above the  
reservoir belonging to the Laramie Water Company. The company  
that owns Lake Hattie and some other reservoirs and operates near  
Laramie. Mr. Meeker had charge of the automatic register at the  
iron bridge. At present there is an automatic register at the McGill  
station. It also belongs to the Laramie Water Company. That  
gauge has been there this season, 1913. Mr. Meeker kept the  
190 gaugings there last season. We have very few gaugings at  
that point. I have some gaugings taken there last season,  
1912. There were none taken prior to that. On what we call Mc-  
Gill station, they were taken about once a week to ten days, the  
balance to determine the discharge were taken at what we call Phelps  
bridge on the Sybille. I also gauged the Sybille at Phelps  
191 bridge. I took measurements there last year, 1912. To a  
certain extent during 1913. I have a gauge bar there. It  
has to be read. I have no automatic. The gauge was read from one  
to three times a week. If there is any change in the delivery gauge

at the reservoir the reading would be taken, the reading was taken after the change. I think that was true in each case.

The measurement of the capacity of the ditches was entirely computed by gauging. There have been gauge rods in the ditches.

192 On No. 1 canal there is a gauge rod at the head; also at a point about 12 miles down the canal after about 4 second feet have been diverted from the canal. The gauge at the diversion of No. 1 canal is located on section 30, township 23, range 68. On No. 3 canal there is a gauge at the headgate and also one at the same gate which is about 1,500 feet down the canal. On No. 2 canal the gauge is just below the sand gate. On the sand-gate structure about 1,500 feet below the head of the canal. These rods were placed in there last year, 1913. There were none before that. I do not know of any former gaugings being made on the ditches before I went there. None were made after I went there and before these were installed. Our records are for the years 1912 and 1913.

Neither the board of control, the state engineer, the division engineer or the water superintendent or any other water official have ever compelled us to release water from either No. 2 or No. 1 reservoirs. They have in no way interfered with either the storing or the diversion of water in our system. I have a record of the

194 lands in the Wheatland district including the original tract and the Bordeaux tract that have been actually cultivated and irrigated from year to year. We have a map showing irrigated lands in 1910 and -11.

195 Defendants' exhibit 2, prepared by engineer C. C. Washington, purports to show the lands in the original Wheatland tract, the Bordeaux tract and the Sybille or Cooney Hill tract and in the shaded portions lands actually cultivated and irrigated in the year 1911. I have checked this map with our records as to the irrigated lands. The map is substantially correct. There were errors made both ways and I would say that the errors would practically offset each other, with the exception of the town of Wheatland, which is an irrigated tract. That is, within the corporate limits of the town. That is not a farming district. 1911 is the first year upon which I computed records of the irrigated lands. I could not say whether some of the lands irrigated in the original Wheatland tract are lands which formed a part of the project of the Wyoming Development Company in the first instance. There are lands in that area which were not parts of that system but which are now irrigated.

Defendant's exhibit 2 correctly details these lands irrigated in

196 the Bordeaux tract. Canals Nos. 1 and 2 of this system do not have any wasteway. Ordinarily any surplus of water in our canals increases the head of water in the canals, and of course increases the delivery through each of the various canals and laterals along the line of the canal. We do not have any wasteway for any of the individual laterals. In the case of laterals it is entirely regulated by diversion boxes, and if there is surplus water in the lateral each user under that lateral gets his proportion of the excess.

There is no definite system of turning the water back to the

197 stream. The water from the canals is measured out to consumers. Measuring weirs are used, although there are some

laterals where measuring weirs have not yet been installed. Perhaps 20 per cent of the smaller laterals. These weirs were installed in 1911 and -12. Prior to that time there was no system of measurement on these laterals. Several farmers draw through the same lateral. The farmers divide the water by division boxes. The company holds them down to a specific amount of water. The water is measured at the head of the lateral only. Sybille creek is used as a wasteway for surplus water at the head of canals Nos. 1 and 2. The crops raised in the Wheatland district in 1911 were not up to standard of yield.

Prior to becoming associated with the Wyoming Development Company as assistant engineer I lived in Cheyenne. I came to Wyoming during the fall of 1908. My work was not confined to Cheyenne and vicinity, it consisted of work on various projects over the state. I was in the state about a year before I became associated with the Wyoming Development Company as assistant engineer.

The farmers under this system do not take all the water they are entitled to all the time during the irrigation season. The height of the ground water is gradually rising. Drainage has not yet become necessary. Seepage has not affected the entire area to any great extent. It is rising right along. There is a part of the tract where there is no water-table visible at all, but on the lower lands in the neighborhood of 7 feet. By the lower lands I mean that the land is rolling, such as around the vicinity of Wheatland and on the outskirts of the colony and further out on what we know as the bench the water plane is higher. At Wheatland the water plane is 456 feet, owing to the fact that there is no surplus water. The lower land that I have mentioned, where the water-table is about 7 feet below the surface, is to the north of Wheatland, probably 4 miles, extending practically over the entire colony east and west from there to the Laramie river. Possibly six hundred acres are included in this district where the water comes within 10 or 12 feet of the surface. The water-table of the tract varies.

#### Cross-examination by Mr. Delph E. Carpenter:

As soon as irrigation on a tract is completed, the farmers order their water out. It has been done with nearly all of the farmers during the last two years. The average farmer has been drawing water from 80 to 85 per cent of the irrigation season. That would be during the continuous run up to August 15th. The men with the lands in these lower valleys do not demand it that much of the time. Their demands are diminishing from year to year. Demands are not noticeably diminishing on the higher or bench lands. The first orders to shut back water come ordinarily about the latter part of June. The time that it is shut back depends entirely on the help the farmer has; if he has a man he can spare for irrigation it is turned back on in a few days onto the part that has been harvested and it is wet again. At that time, however, the demand for irriga-

tion is not so imperative as to require the immediate return of the water to the land after the hay is off of it.

203 The hay harvest varies in duration. The harvest of the first cutting extends over a period of about three weeks. During this time the water would be shut back about 15 per cent of the time. Whether we diminish our head from the reservoir depends entirely on the length of time that they figure they want the water out. If it is only a small amount that is out it is run into No. 1 reservoir and can be distributed later. When the water is ordered on again by the farmers they irrigate their alfalfa for the second cutting. It is harvested from the latter part of July to the middle of August. Ordinarily if the farmers have not watered their grain at the time of the first cutting the water is then used on the grain or beets or some other crop during the time of the second cutting. After the 15th of August the demand for

204 water is greatly diminished. We close out the last small run about September 15th. With the exception of the third cutting of alfalfa irrigation is laid by. There are a part of the farmers who want water for the third cutting. About one-half of the farmers cut a third cutting of alfalfa. By rotation of water I mean that if the indications are that there will be a shortage of water we run it in what we call sections. The farmers are allowed to use the water as they see fit and the water drains off and flows back into the Chugwater and Sybille and other creeks.

205 I have ordered several farmers there to quit wasting water. There is hardly a day during the irrigation season that this is not done, that is, if you call wasting letting it get away from them. There is a sand creek over near the west edge of the area that has a constant flow since irrigation took place in the Wheatland district. Above the canal No. 1 Sand Creek is very dry, although the west bank of Sand Creek is not. That comes out of the foothills. The water flowing down Sand Creek and into Sybille all the time is not considered seepage water. There is a constant flow of water from the Sybille into the Laramie, that is occasioned

206 by the seepage from the Wheatland tract and also at the mouth of Chugwater occasioned by the same source. There is a general depression through the Wheatland area from near the town and off in a southwesterly direction that carries in the bottom of the depression a seepage ditch where water is flowing at various days. I do not think the water in the channel is occasioned in large measure by waste flow from the farms above and along its course. I think it is natural seepage, but it depends a great deal on the weather when it comes up. The seepage flow has increased to a certain extent since I have been there. That leads me to believe that the general water plane under this area is becoming higher.

207 In 1912 I delivered about 100,000 feet of water to our water consumers on the original and the Bordeaux tracts. In 1912 we obtained practically no benefit at all from the several floods that occurred down the Sybille. The time at which we begin to draw water out of No. 1 reservoir, varies in a period of years.

Reservoir No. 1 is used practically for a. distributing reservoir. In case we have an additional supply coming from reservoir No. 2 it is necessary for delivery into the canals to run it into No. 1 reservoir. If we have not sufficient water to make the delivery it is taken into No. 1 reservoir to supply that canal, and the shortage is made up out of No. 1 reservoir for No. 2 canal. It will impound water about 40 feet deep. If we were to draw more of the water in No. 1 reservoir out early in the year we would not be in a better position to conserve the Sybille water during the summer months.

We use the small normal flow of the Sybille as it is.

208 During such times the water in Sybille lasts only a few hours and we can carry all the water out No. 2 ditch will then take away. In the case of heavy rains the flood gradually diminishes and sometimes continues in diminishing quantity over two or three days.

We began to draw from the stored water in No. 2 reservoir May 4, 1913. In 1912 we started May 25th. These are the years that I have had charge of the distribution of the water. The demand for water is much less at the beginning of the irrigation period than along about the 10th or middle of June. We carry the greatest amount of water for distribution to farmers during the latter part of June. The demand starts in May and gradually increases up to about the middle of June. We are carrying our maximum head until the latter part of July ordinarily. It gradually diminishes up to the 15th of August. After August 15th we make a couple  
209 of runs for beets between that and September 15th. At those times the farmers also irrigate their trees and whatever else they have to irrigate at that period.

Something over 700 acres of sugar beets were raised in the Wheatland district in the year 1913. There have been as high as 2000 acres in one year. The first year they raised sugar beets there, either in 1910 or '11 they raised that acreage. About 400 to 500 acres of beets were raised in 1912.

The floods on the Laramie usually begin from the 10th to the 20th of June. The river was gradually rising in 1911 from the 20th of May and ran up to 20th of June and in 1912 began to rise about the 26th of May and reached its height about the 19th of June. The peak of the flood was about the 12th of June. The

method used in taking the observations relative to the flow  
210 in the ditches has depended on the amount of water that we had in the canals. Sometimes it is measured by wading about a mile below the head of No. 1 canal. If it is too deep for wading at this point the entire flow is gauged at Phelps bridge and the amount of water going down the Sybille which is going past our headgate on No. 1 canal is also gauged and subtracted from the first gauging. We make the gaugings on the Sybille about a half a mile below where No. 1 ditch takes out. I then assume that the difference between the two figures is what is going into ditch No. 1. No. 2 canal is measured at a bridge below the sand gate about 500 feet. At the head of the first lateral, several miles down the canal, we waded. We measured just above the head of the lateral. The



current comes around a curve and is not uniform. It is sufficiently uniform so that we could get a correct grading.

211 The new canal from our Wheatland canal No. 1, which supplies the Bordeaux tract, is Wheatland Industrial Company's canal No. 1. The canal which diverts water from the Blue Grass and carried it over to the Sybille tract is the Wheatland Industrial Company canal No. 2. In those canals a tunnel was constructed through intervening ridges. The tunnel on the industrial canal No. 2 is 900 feet long and is complete. It was completed in

1911 or '12. During 1913 we have run on an average about 212 18 cubic feet of water per second to the Bordeaux tract. No water has as yet been run to the Sybille tract. The capacity of Industrial canal No. 1 is 150 second feet. That of Industrial canal No. 2 is about 300 second feet.

212 Redirect examination by Mr. John D. Clark:

The net distribution of water to the Wheatland lands in 1912 was from 2.6 to 2.7 acre feet per acre. This was determined by the actual deliveries at the heads of the laterals.

Last year the seepage and evaporation on No. 1 canal amounted to about 16%. On No. 2 I have forgotten but it was not so much.

I haven't checked the figures for this year.

213 The nearest large irrigation project to the Wheatland project is the Interstate, near Torrington, Wyoming, about 45 miles from Wheatland. That belongs to the United States Reclamation Service. That is a trifle lower than the Wheatland. Soil about the same. In 1912 the distribution there was 2.55 acre feet per acre, in 1911 4 feet per acre.

Recross-examination by Mr. Delph E. Carpenter:

213 The land under the Interstate project is sandy loam. I never went over the Interstate land in detail in Nebraska, but I have in Wyoming. My familiarity with the Interstate project is limited, for at least two or three years. The figures I have given are by those in control of the project. I obtained them from

214 Mr. Andrew Weiss, the supervising engineer. He has not been co-operating with me in this suit. The figures are also put out by the Water Users' Association of the Platte Valley. I would not call the country which the Interstate travels for some 50 miles before water is really applied in large quantities unusually sandy or gravelly.

I should judge that the canal No. 1 of the Wyoming Development Company is from 250 to 300 feet higher than the station at Wheatland. It is 4,738 feet.

Recross-examination by Mr. Fred Farrar:

215 This Interstate canal receives water from the Pathfinder dam. It is a part of that general reclamation project. The laws of the State of Wyoming fixed the maximum amount which



may be decreed to any given area of land. The maximum that may be decreed is one cubic foot per second of time for 70 acres of land. Under the Wyoming law the water is appurtenant to the land on which it is decreed. It must be used without waste, that is the maximum amount allowed. If a less amount will suffice they are only entitled to that amount.

217 RALPH I. MEEKER, a witness in behalf of Complainant.

Direct examination by Mr. N. E. Corthell:

Reside at Laramie. Am a civil and hydraulic engineer. Have had 13 years' experience,—6 on irrigation engineering, 5 on hydrographic engineering and 2 on mining, with the U. S. Geological Survey, the Reclamation Service, Central Colorado Power Company and with Mr. Doble, Consulting Engineer of Denver. My work embraced stream gauging in Colorado and all the adjoining states for 11 years. Have been employed in hydrographic investigations for the Laramie Water Company on the Laramie river in Wyoming and Colorado continuously since May, 1912.

218 Have established stations on the Laramie River for the measurement of its flow at the Pioneer Dam, at Lookout, and at McGill. Other stations have been established through co-operation with the State Engineer of Wyoming.

The Pioneer dam is about 4 miles below Woods Landing, and at the head of the Laramie River irrigated area in Wyoming and about 13 miles from the Colorado state line. Fox Creek, Woods Creek and Bear Creek flow into the Laramie between the Colorado line and this gauging station. The Pioneer Dam is the diversion point for the Pioneer Canal, and the Lake Hattie Reservoir.

219 The Lake Hattie Reservoir takes its water from Pioneer Canal about 4 miles from the head-gate. That portion of the canal is called the Pioneer Enlargement. The Pioneer Dam is a concrete overflow structure 89 feet long, the crest is about 3 feet above the bed of the stream. The entire flow of the Laramie except as diverted in ditches above passes over the dam which thus constitutes a weir over which the entire flow of the stream is measured. The Lookout gauging is at the steel bridge 33 miles north of Laramie and 1½ miles above the high water line of the Wheatland Reservoir, and about 85 miles from Pioneer Dam. There are no diversion ditches between Lookout and Wheatland Reservoir No. 2. The principal irrigation on the Laramie except through the Wheatland system and the ditches below takes place between these two stations.

220 The third station is at McGill, 1 mile below the dam for Wheatland Reservoir No. 2.

The equipment at Lookout consists of a steel bridge from which all measurements are taken except in low water when sometimes wading measurements are taken, and a chain gauge and a Bristol Automatic Water Stage Register. The McGill station has a steel cable 189 feet long, a vertical staff gauge and a Bristol Automatic Water Stage Register. There is also an Automatic Water Stage Register and a staff gauge at Pioneer Dam. By means of these I

have measured and recorded the flow of the Laramie covering 1912 and to August 22, 1913, the present time, and tabulated the flow. Table introduced Exhibit B.

(Copy of Complainant's Exhibit B.)

*Laramie River Run-off.*

Run-off, 1912.	Distribution.	Acre-ft
Laramie River at Pioneer Dam near Woods, Wyo.	Pioneer Canal.....	17,703
Run-off Jan. 1 to Dec. 31, 207,000 acre-ft.	Lake Hattie Res.....	69,855
	All other ditches between Pioneer Dam and Two Rivers.....	29,892
NOTE.—Jan., Feb. & March run-off estimated as 8,300 Acre-ft.	Wheatland Res. and Intermediate ditches below Two Rivers.....	89,550
		<hr/> 207,000

Run-off, 1913.	Distribution.	
Laramie at Pioneer Dam near Woods, Wyo.	Pioneer Canal.....	10,983
Run-off Jan. 1 to Aug. 31, 95,682 Acre-ft.	Lake Hattie Res.....	28,470
	All other ditches between Pioneer Dam and Two Rivers.....	18,167
NOTE.—Run-off for period of Aug. 21 to 31 estimated as 748 acre-feet.	Wheatland Res. & intermediate ditches below Two Rivers.....	38,062
		<hr/> 95,682

*Monthly Discharge of Laramie River at Pioneer Dam, Near Woods, Wyoming, in Acre-feet.*

	1912.	1913.	Mean.
January .....	.....	2,650	2,650
February .....	.....	2,355	2,355
March .....	.....	3,296	3,296
April .....	5,534	12,674	9,104
May .....	40,643	38,307	39,475
June .....	91,874	26,598	59,236
July .....	34,863	6,764	20,814
August .....	7,809	3,038	5,424
September .....	4,641	.....	4,641
October .....	6,456	.....	6,456
November .....	4,403	.....	4,403
December .....	2,644	.....	2,644
Total.....	198,867	95,682	160,498

NOTE.—August 18 to 31, 1913, run-off estimated.

These records secured by the Laramie Water Company.

R. I. MEEKER,  
Hydrographer.

## Cross-examination by Mr. Fred Farrar:

221 Pioneer station is on the crest of the Pioneer dam. This estimate does not show water which is taken out immediately above the dam. This estimates the total volume at the dam, and includes the water diverted by the Pioneer canal enlargement. Tabulation offered is a summation of the water diverted by the Pioneer canal enlargement and volume of water passing over the Pioneer dam. This is the total record of the gauging stations at Pioneer dam and at Pioneer enlargement. The Bristol register at the Pioneer dam is run for ten day periods. The charts are taken off every ten days. All station charts are for ten day periods. I have ten day records, from which this is compiled, with the exception of the Pioneer enlargement, which is not equipped with a register, but with a chain gauge and the readings are secured twice daily by the diten tender.

By Mr. Farrar: On behalf of the defendants, and each of them, we object to the introduction of this exhibit "B" on the ground that it is not the original record and is a mere conclusion of the witness; and for the reason that it does not show the readings from which these conclusions were made. We object also to the introduction of this exhibit until the original record has been taken by the witness and first introduced. In order to supplement this objection at this time, I request that the original records be produced for our examination.

## 222 Direct examination by Mr. N. E. Corthell (cont'd):

My original records are at the office of the Laramie Water Company. 17,703 acre feet of water was distributed to Pioneer Canal and 69,855 acre feet to Lake Hattie Reservoir in 1912 which did not pass over Pioneer Dam. The total flow of the stream in 1912, January 1-December 31, including that which passed over the dam and that which was diverted by Pioneer Enlargement was 207,000 acre feet. The 29,892 acre feet in the table is the amount of water lost in the river between the Pioneer Dam and the Two Rivers gauging station.

223 The 89,550 acre feet in the table is the volume of water at Lookout and does not include the water contributed by the Little Laramie. It includes the amount diverted by ditches between Two Rivers station and the Wyoming Development Company's reservoir. The table for 1913 is made up in the same way as the first table.

The total run-off of the Laramie including tributaries above Pioneer dam in 1912 was 207,000 acre feet. For 1913, up to August 31, was 95,682 feet.

No measurements were made in January, February and March, 1912.

224 The estimated run-off for those three months is based on the winter records secured in 1913. For the other nine months of 1912 the measurements were 198,867 feet. The figures in

the first and second columns of the third table are actual measurements. We kept a record of the total inflow into Wheatland reservoir No. 2 in 1912. From May 27 to December 31, 1912, 225 119,766 acre feet. On May 27th, 1912, there were approximately 29,000 acre feet in that reservoir; on September 16, 22,000 acre feet. That is practically the period during which water was drawn from that reservoir in 1912.

The outflow from that reservoir May 25 to December 31, 1912, was 95,653 acre feet.

On April 29th, 1913, the Reservoir No. 2 had about 76,000 acre feet of water. They began to draw water from it May 3, 1913. The amount in the reservoir August 18, 1913, was 15,000 acre feet.

226 May 1 to Aug. 17, 1913 the inflow was 90,053 acre feet.  
Jan. 1 to Aug. 18, 1913, 63,463 acre feet.

Ex. C introduced. A sketch Map of Gauging Stations.

Ex. D introduced. Hydrograph of Flow in the Laramie.

The solid zig-zag line on Ex. D represents the flow of 1912, and the broken line the flow of 1913, and the dotted line the resulting mean by months.

227 The figures on the left denote the monthly flow in 1,000 acre feet.

The records of the witness here tendered to counsel for examination.

The Witness: I desire to correct my testimony by including Johnson Creek and Beaver Creek among the tributaries of the Laramie between the Colorado State line and Pioneer Dam.

228 The flow of 90,053 — in the Laramie between the Wheatland Reservoir and their tunnel, given by me, was the flow from Jan. 1 to Aug. 17, 1913. The flow Jan. 1 to May 2 was seepage from the reservoir and leakage through the gates. The headgates were closed. May 3 to Aug. 17 the total included outflow from the reservoir plus the seepage.

228 Cross-examination by Mr. Delph E. Carpenter:

The seepage and leakage at the gates showed an average flow of two cubic feet per second during January and February; three cubic feet per second in March, and four cubic feet per second in April. The Wyoming Development Company began to draw water from the reservoir May third. They drew water up to the 17th in varying quantities as shown by my measurements. Defendants' exhibit No. 4 is a tabulation of the daily flow during 1912 as shown by my records, including the "remarks." It is checked and signed by me.

By Mr. Farrar: Let the record show that exhibit No. 4 is produced by Ralph I. Meeker, a witness on behalf of plaintiff, on his cross-examination by the defendants.

229 Gaugings were made approximately ten days to two weeks apart at the Lookout station. From these I established a

rating curve for this station. These data were worked up by the shifting channel method, using the Bolster Method, using a standard rating table, and corrections being made between the discharge measurement and this curve for the daily discharges. The shifting channel method of computing the daily discharge was used at this station for the reason that a bed of silt and sand is deposited usually in the winter and scours out during high water stages, giving a changing cross-section. I made several measurements at Two Rivers, Wyoming, in 1912, but did not maintain a station there. The station was maintained by the State of Wyoming and the U. S. Geological Survey. When making trips which would take me across bridges in that vicinity I made discharge measurements to check the work of the state and the U. S. G. S.

230 There was a station maintained by the State of Wyoming and the Geological Survey on the Little Laramie river during the season of 1912, near the Two Rivers station. I made readings and checked that stream and the measurements made by the other parties. I began to take my measurements at the iron bridge immediately above the Wheatland reservoir on May 27, 1912. From May 27, to December 31, 1912, there was an aggregate of 119,766 acre feet flowed into the reservoir. In the meantime a chain gauge was installed and gauge readings were taken morning and evening by several observers, at different times.

231 A weight standard chain gauge of the U. S. Geological Survey consisted of a weight weighing about eight pounds with a chain and pulley and a staff gauge nailed horizontally on the bridge, the observations being taken from station ninety on the measuring section. By the use of this apparatus my gaugers at Lookout station took their readings during the summer of 1912. I compiled a table. (Plaintiff's exhibit No. 4.) The Two Rivers station is located approximately one-third of a mile above the confluence of the two streams. The flow indicated at Two Rivers would be the flow of the Big Laramie alone and would not include that of the Little

Laramie. It would be necessary to add the flow in both  
232 streams in order to obtain the total flow of both of Little Laramie and the Big Laramie at the confluence. I did not prepare a table for the Little Laramie river station. I have taken the data of the state engineer's office. That data is published in the biennial report of the State Engineer of Wyoming for 1911-12, pages 92 and 87. On June 15, 1912, the elevation of the water surface in Wheatland reservoir No. 2 was 23.7 above the outlet floor. That was taken from surveys. On that trip I found a two by eight gauge on the outlet pier which had just been installed. An elevation of 23.7 feet above the outlet floor equals 3.70 feet on  
233 the staff gauge. The gauge on the outlet pier does not reach to the floor zero of the outlet. It only reaches for 14 feet.

It is an arbitrary gauge put on there for high water readings. The difference between the actual depth found by me from surveys and the reading on the rod is 20 feet. The figures on the gauge rod at the reservoir in 1912 read from zero to 14, from the bottom up. The rod was submerged 3.70 feet when I made the survey. It was dis-

placed laterally this spring, and there is a difference of about two-tenths of a foot between the readings of this year and last year. To illustrate, had the rod in 1912 been as in 1913, the reading I have shown when I found the depth stated would have been 3.5 feet. Other than this difference, the same rod is now and has been in place during the year 1913, the rod is displaced laterally, being anchored at the same place, being moved out and up a little vertically. The rod is not vertical today. In order to make these readings correspond you would add two-tenths of a foot to the 1913 reading to give the corresponding reading of 1912 for the same depth. To make my 1912 reading correspond with the gauge as it is in 1913 I would subtract two-tenths of a foot from the readings of 1912. The gauge rod has been raised two-tenths of a foot.

The maximum depth of water in the Wheatland No. 2 reservoir in the year 1913 was May 11th, 27.05 feet. That was the highest reading I secured. My readings were taken ten days apart.

235 The water in Wheatland reservoir No. 2 was 3.35 feet deeper in 1913 than in 1912. At the time of finding this maximum depth in 1913 I ascertained the height of free-board between the then high water line and the top of the fill at the outlet gate to be  $6\frac{1}{2}$  feet. The top of dam is 33 feet plus or minus above the flow of the outlet tube. The dead water in 1913 reached to approximately one mile below Lookout station at the iron bridge. May 11, 1913, the maximum depth of water in the cross-section in the Laramie river at the steel bridge above the Wheatland reservoir, was 1.5 feet at station 30. I continued to keep a record of the

236 flow of water at Lookout station after December 31, 1912.

I have a table showing the daily flow of the water at this station for 1913. I am keeping up my observations. The table shows the daily flow for 1913 including August 17.

(Plaintiff's exhibit 5.)

By Mr. Farrar: Let the record show that the exhibit 5 was produced by the witness on cross-examination.

I maintained a gauging station at McGill's ranch. The station was established May 27, 1912. I have a table prepared from such observations showing the daily discharges.

(Witness produces Plaintiff's exhibit 6.)

I maintained the McGill station for 1913 and have a table to August 17th.

(Witness produces table plaintiff's exhibit 7.)

I am continuing my measurements at this station.

The Laramie Water Company, co-operating with the U. S. Geological Survey, is maintaining a portion of the expenses of a station near the mouth of the Sybille Creek. The same on the Laramie.

238 Staff gauges are maintained at both stations. In 1912 I visited the stations and made a few discharge measurements.

I did make measurements at Sybille in 1913. The U. S. Geological Survey and the State of Wyoming in co-operation pre-



pared a table showing the daily flow of the Laramie river near Wheatland and immediately above the mouth of Sybille Creek. That table is published in the biennial report of the state engineer of Wyoming for 1911-12, page 90. There was no table published showing the daily discharge of Sybille creek at its mouth. I have measurements showing discharges on the dates that I made measurements on the Sybille. I believe I gave them to the U. S. Geological Survey. In 1913 I made measurements on Sybille creek  
239 at various points. I made no measurements on Sybille creek above the mouth of Blue Grass. I have not made any  
240 measurements on the Laramie river or any tributaries below the mouth of Sybille. In 1912 and 1913 I made measurements below the Wheatland tunnel dam.

During 1913 I established a new gauge rod at Two Rivers station and employed an observer until co-operation was secured with the State of Wyoming, and also made discharge measurements at various times. I obtained co-operation the first of May. The state of Wyoming has also had its hydrographer busy at those stations. Between  
us we have furnished the information for the joint benefit  
241 of our employers. The same is true of the Little Laramie station for the year 1913. I established a new gauge there and employed an observer until the state co-operated. These gauge rods are located for all practical purposes as in 1912; the gauge on the Big Laramie river being about 340 feet below the old measuring section at the bridge and on the Little Laramie river the gauge is about 300 feet above the wagon bridge where the old gauge is located. The juncture of the two rivers is about one-third of a mile down stream from the gauge station on the Big Laramie. About one-half mile from the gauging station on the Little Laramie. The gauge heights are obtained by observers evening and morning. I have turned over to the state engineer the results of my measurements during 1913. The heights are practically in up to date, but not  
all the discharge measurements.

242 In the table produced in my direct testimony as to run-off from Laramie river for 1912 I give run of water into the Wheatland reservoir at 89,550 acre feet. That should be corrected. That is the deduction of the Big Laramie at Two Rivers. This table deals with the Big Laramie only. It does not take into consideration the Little Laramie. In 1912 stations were maintained by the Laramie Water Company at Hattie Supply canal No. 2 dam and at Hattie Supply canal 24 feet below the headgates, also on the Bellamy canal at Wright's ranch 800 feet below the headgate.

The gauge height observations on the Little Laramie were  
243 secured in 1912 at the Dougherty bridge one-half a mile below the dam. In 1913 the records at this station have been secured at one dam. Several small ditches divert water from the river above the dam to Lake Hattie Supply canal No. 2 beside the Bellamy canal. The May and Porter ditches are above the dam. Mr. Wright has a small ditch or two used to irrigate meadow land on the river, with the exception of the Porter ditch which takes water which does not return. The Porter ditch is used for meadows

on a foreign drainage channel. They are taken through the divide, and there are no waters from that ditch after they are used for irrigation. They go to Lake Hattie. Not all ditches drain back into creek above dam. Farr ditch would have a small drainage back above the dam, but the major portion of the water would return below the dam. Also the Dougherty ditch returns some water below the dam. Both return water into the Little Laramie. During

244 1912 a staff gauge was maintained and observations taken morning and evening by James Dougherty at the Dougherty bridge. In the fall a Bristol automatic Water Gauge Register was placed at the dam, a staff gauge being there already. Since that time the records have been secured at the dam. The automatic at the dam registers the water passing over the crest of the dam and from leadkage through the dam. During the winter months when ice conditions were bad the records were more or less unsatisfactory and the table of discharges was largely based on discharge measurements. The observations so taken would establish with reasonable approximation the flow of the stream during the ice conditions. At the station in Lake Hattie Supply canal No. 2, about 400 feet below the head of the ditch, a chain gauge was maintained. Observations were taken morning and evening. The automatic register at the

Fillmore station ran all winter, but I gave very little weight 245 to the charts. I began to rely upon the measurements shown by the automatic a few days before April 1st. The records of 1912 in the Bellamy canal were based on my visits to that station and for a short time gauge readings by one of the workmen at No. 2 dam. In 1913 a staff gauge was installed at the Wright ranch and continuous observations secured since then morning and evening. During the winters of 1912 and 1913 I saw one to three second feet at times leaking through the gates of Bellamy canal. I am the custodian of the records obtained at these three stations during the year 1912 and thus far during 1913.

246 Cross-examination by Mr. Fred Farrar:

By the word "discharge" marked on defendants' exhibit No. 4, and No. 6, I mean discharge in second feet. The chart shows the daily mean discharge in cubic feet per second. The daily mean discharge was obtained from readings, one in the morning and one in the evening. I do not recall any readings introduced where there has been but one reading. Where one reading a day was 247 taken, the record shows the flow the instant in which it was read.

Further cross-examination by Mr. Delph E. Carpenter:

There are no records in 1913 for Hattie Supply Canal No. 2 in the Laramie river, no water being carried this year. The data on Sybille creek and the rating stations there will be given you. I will permit the engineer for the defendants to examine the charts from our automatic and such other matters as they desire. As to

248 plaintiff's exhibit B, there are two tables under the general head of Laramie river run-off, and these tables assume a given run-off for 1912 and '13. In the upper or 1912 table the figures 89,550 acre feet designate water passing at the Two Rivers station down the Big Laramie and stored in the Wheatland reservoir in 1912, and does not include the discharge from the Little Laramie. The same is true as to the 1913 table and the figures 38,062 acre feet. The water from the Little Laramie river, which may have passed into the Wheatland reservoir in 1912 is not included within this sum of 89,550 acre feet. The same thing is true in 1913, 38,062 feet. Those two figures show the flow from the Big Laramie river. The acre feet indicated as going into  
249 the Wheatland reservoir in the years 1912 and '13 on those tables is not the total amount that actually flowed down the river to that reservoir. I was only dealing with the amount of water passing through the Big Laramie river at the Pioneer dam.

In the memorandum map handed to counsel, there appears a rating station maintained by the Laramie Water Company on Douglas creek. That station was there in 1912 but not in 1913. Douglas creek is a tributary of the North Platte River. The station was maintained because the Laramie Water Company has under construction a supply canal for their irrigation system from Douglas creek, known as the Bell Supply Canal No. 2.

250 This ditch, in process of construction, under permit issued by the State Engineer of Wyoming, was commenced in 1912. That canal is for diverting the waters of Douglas creek, a tributary of the North Platte river from its watershed over into the watershed of the Little Laramie River, which is a tributary of the Big Laramie River. It is an inter-watershed diversion by an open canal very similar in its relation to the two streams to the Sky Line ditch of the Water Supply and Storage Company, which diverts water from the Laramie river into the water shed of the Cache la Poudre. I have memoranda showing results of my ratings at that station in 1912. I have table requested showing summary of elevations of water surface at various times in Wheatland  
251 reservoir No. 2 during 1912 and '13, insofar as my observations went.

(Defendants' exhibit 8.)

The various volumes in acre feet noted in the third column of figures and just before the column entitled "Remarks" were derived from a capacity curve of the Wheatland reservoir, prepared from the contour map filed in the state engineer's office of Wyoming.

On my memorandum map, there is indicated a station maintained by the Laramie Water Company at Lake Hattie reservoir outlet which has a gauge rod showing the elevation of the water surface of the reservoir. In 1912 there was no water drawn from the reservoir.

July 13, 1913, the first water was run from Lake Hattie reservoir down the outlet canal. With the exception of closing down for a day or two, the water has been running continuously since. Gauge

- rods have been established in the north and south canals below where the outlet from Lake Hattie reservoir divides into two parts and discharge measurements have been made by means of gauge readings. A gauging station is at the outlet of the reservoir this year. Since July 13, water has been running more continuously from the outlet canal than down the north canal. There have been several small breaks and repairs necessary to the north canal that have necessitated the cutting of the water therefrom at various times for a day or two. The water run to the north canal has been largely used by irrigators. I have crossed the canal on the road to Two Rivers, but not since there was water in it, and the lowest gauges I have made on it were on the Ridge road bridge, approximately two miles west of Laramie. I have the records of Lake Hattie reservoir at the gauge rod station for 1912 and 1913. It shows the depth of water in the reservoir at the various times noted above the outlet. The outlet baffle on the lower side of the dam is taken as the zero point, the lowest point at which water can be withdrawn from the reservoir. The baffle wall extends directly across upper end of the canal and is some little higher than the bottom of the outlet tube. Its purpose is to kill the velocity of the outflow from the reservoir. I believe it is about three and one-half feet above the bottom of the outlet tube. My table showing amount of water in Lake Hattie reservoir during 1912 and '13 showed the depth in feet above the baffle wall.
- 254 The records have been obtained by me or under my directions. The records which will be furnished will be complete. I have also maintained stations on the Laramie river at Woods Landing, near the mouth of Fox creek, a tributary of the Laramie river, immediately below Woods Landing, and at the Pioneer dam, at the head of the Pioneer ditch, including a station in the Pioneer canal itself. The station indicated by my plat as being maintained by me below the one maintained at the head of the Pioneer canal is the old Pioneer canal at Weir No. 1. It is approximately 1000 feet below the bifurcation structure in Lake Hattie supply canal No. 1. Lake Hattie Reservoir is supplied from the Big Laramie through the Pioneer canal enlargement and Lake Hattie Supply canal No. 1, and from Little Laramie river by Lake Hattie supply canal No. 2. The reservoir is between the two streams. Hattie Supply canal No. 1 leaves the old Pioneer canal, as enlarged, at the bifurcation structure. The old Pioneer canal was enlarged from the headgate to Sodergreen Lake. At that point bifurcation works were constructed and installed. This also serves as outlet works for the Sodergreen Lake, a small reservoir on the Pioneer canal. From the bifurcation gate the Pioneer canal runs northeasterly and the Lake Hattie Supply canal No. 1 goes northwesterly. It is about six miles from the bifurcation structure to Lake Hattie reservoir. The old Pioneer canal was not enlarged below the bifurcation structure. I have a station on the old Pioneer canal below the bifurcation structure. It was maintained for 1912 and '13. It indicates the volume of water used by the Pioneer canal, with one exception, being above all laterals. There

is the Bloom lateral which takes out of the old Pioneer canal prism above the Sodergreen Lake. I have complete tables which show the water which flowed in the Pioneer canal during 1912. Similar records for 1913 are only partially completed.

257 Water is run in October.

The gauging station on Fox creek is located at the county road bridge to Woods Landing. I did not install the gauge at that station, using the one that was there in 1912. During 1912 I made discharge measurements and employed an observer to read that gauge during the month of June. The record was discontinued on July 2 for the reason that the flow had fallen to two second feet at that time. No gauge readings were secured in 1913 other than those made by myself and in that vicinity. The gauge rod at the Fox creek bridge was installed by Professor L. G. Carpenter. Graduations were made with brass headed tacks. I have the memoranda showing the discharge of Fox creek as obtained by me at that point during 1912 for June. Subsequently I only had miscellaneous readings on the gauge. The two Berg ditches, one of which

258 takes out a few hundred feet above, and the other some distance above the mouth of the Fox creek cañon, divert water on Fox creek. They are small private ditches. The lower Berg ditch can draw water from either the Laramie river or Fox creek. The record which I obtained at the Fox creek station shows water flowing there which would be that in excess of the diversion by the Berg ditches.

May 29, 1912, a staff gauge had already been established at the Pioneer dam, the zero point being at the crest of the Pioneer dam.

Gauge readings were then being secured by Angus Matheson, 259 ditch tender for the Pioneer canal enlargement. Later in

1912 a Bristol Automatic Water Gauge Register was installed at this station. I began getting the data at this time. During 1912 an observer was also employed, Asa Brooks, during June and July, to read the old U. S. G. S. gauge at Woods Landing bridge as an auxiliary station. During 1912 it was necessary to make discharge measurements at high water stages from the Woods Landing ditch because the entire flow of the river was confined at that station. Further on in the year when the water receded measurements were made. The gauge reading was continued daily at the Pioneer headgate by Mr. Matheson up to the time I established the automatic gauge at that point. During the high water stage of 1912 the river overflowed the meadows on both sides below Wood's Landing and above the Pioneer dam and it was not possible to secure discharge measurements between those points or immediately below the Pioneer dam. At the time I commenced hydrographic work there was no gauge in the Pioneer enlargement. A gauge was established at that point

260 by myself 1.7 miles below the headgate. Shortly after June 1, 1912, May 29, a temporary gauge was installed in the Pioneer canal, approximately 1800 feet below the headgate.

The gauge at the Johnson bridge is a chain gauge. Daily readings were kept by Angus Matheson on these Pioneer gauges. They have been continued, W. H. McComber reading the gauge in 1913. Dur-



ing 1913 the gauge height observations have been secured by the Bristol Automatic water stage register at the Pioneer dam. During my observations in 1912 I ascertained the daily discharge of the Laramie river at the Pioneer dam. I have a table showing such discharge.

(Defendants' Exhibit No. 9.)

This is a copy of the table showing the daily discharge of the Laramie river at the Pioneer dam, including the water passing over the dam and that going into the canal for 1912. During my observations at Woods Landing I compiled a record showing the daily discharge of the river at that point. I hand you a copy of the table, being Exhibit No. 10.

This shows measurements for June and July at Woods Landing, Wyoming. It is complete for 1912. I compiled a table showing the daily mean discharges of the Pioneer canal for 1912, during the observations at Johnson's bridge. The total daily mean discharge of the Laramie river for 1912 at the Pioneer dam was derived by adding the flow passing over the dam and the amount of water diverted by the Pioneer canal enlargement. The volume of water passing over the dam during June and July was derived from discharge measurements made during high stages at Woods Landing bridge, with gauge height readings at the Pioneer dam and Woods Landing bridge, both before and after the discharge measurements. Deductions were made for diversions by ditches between the two points and additions for inflow between the two points. In some cases discharge measurements were made of the flow in each  
262 of the ditches diverting water between the bridge and the

Pioneer canal. In other cases the elevations of the water surfaces in the ditches was determined from a reference point and later when sufficient measurements had been made to construct the discharge curve the volume of water was determined. With reference to two or three of the smaller ditches no specific discharge measurements were made, their volume being estimated from cross-section area and velocities. During latter half of July and succeeding months the discharge over the Pioneer dam was determined by measurement by wading immediately below the dam. During June and July I took into consideration the inflow from Fox creek. The amount shown on exhibit 9 as the mean water flow at the Pioneer dam for both the canal and that passing down the river during each day during those two months, would be the amount at Woods Landing for that day increased by the amount flowing in from Fox creek for that day and from the sum of these two a deduction of the amount of diversions between the Woods Landing Bridge and the Pioneer dam. The mean daily discharge of the Laramie River at  
263 the Pioneer dam for 1912 are based on morning and evening readings at the Pioneer dam and in the Pioneer canal enlargement and at Woods Landing station on the Laramie river for 1913 also. The mean discharge would be the average ascertained by adding the two readings of the day and dividing by two. The readings were taken about 7 and 6 to 7 P. M. In the event the gauge



reader is absent he marks absent on the record. No reading being inserted. I think there were no "absence" on the 1912 record. We do not very often expect a certain percentage of notations of "absent" by the gauge readers. Gauge readers are instructed that if they are unable to secure the reading at a regular time to enter in the record the hour at which they did secure it.

264 Gauge heights were not kept, measurements being made only on days when measurements were made at Woods Landing bridge on the Laramie river. In arriving at the amount of flow at the dam I did not estimate those ditches as constant as of the last date of measurement until the next subsequent measurement was taken. Those factors did not enter into the problem. I did not make measurements at Woods Landing or on those ditches daily. I would say that the discharge curve at the river rating station is based on the measurements made at various times, and it was not essential in determining the flow from the Pioneer dam, that daily records be kept of the volumes of water diverted by ditches between the Pioneer Dam and the Woods Landing gauging station, for the reason that the daily mean discharges at the Pioneer dam are based on gauge readings at that point.

It is a fact that the flow rises and falls with a diurnal fluctuation.

I used a small Price current meter in ascertaining the amount of flow at the rating station during June and July 1912 at Woods Landing. With one or two exceptions, I used the vertical inter-gration method. I have found that method the most satis-

266 factory for all conditions. Speaking of the exceptions, I have in mind when I did not use that method at Woods Landing station, I recall one measurement at high water when the velocity was so great that it was impractical to control the meter below the surface and it was necessary to take surface velocities and apply a coefficient. That occurred on June 5th, 1912. I took the velocity of the current of the water at the surface of the stream clear across and then used the coefficient of ninety per cent to ascertain the current velocity. The meter was held approximately one foot below the surface during high stages. That point is considered virtually the point of maximum capacity of the stream at the point of taking the measurement. At perhaps two or three stations during other measurements velocities were so great that only surface velocities could be secured and in which coefficients were used. I refer to stations in the cross-section at the measuring point at Wood's Land-

ing. The Price meter is an electric meter. It records revolutions. It is difficult to keep count of the revolutions of such a meter when the velocity is in excess of 8 feet per second.

267 On June 5, 1912, the average velocity was 6.16 feet per second. There were some velocities considerably in excess of that. In these electric meters the revolutions are indicated through the ear piece. There is a sort of a small telephone that communicates to the ear each revolution of the wheel of the meter. Record is made by counting and referring to a stop watch. The observer holds a stop watch as the meter turns and counts the number of revolutions indicated and keeps track of the number of such revolutions during

the interval of time involved. The little telephone is not entirely satisfactory when the velocities are very high. The velocities are noted by a little "click," made by the making and breaking of an electric current. At high velocities the making and breaking becomes less precise than at low. The distinctness is also to a degree regulated by the strength and condition of the dry batteries that furnish the current. At extreme high velocities these factors enter into the making of a rating and afford difficulty. At low velocity, the interval between the clicks in the little telephone are much longer and much easier to record. The ability of the observer to concentrate his mind in keeping count enters into the ability to get an accurate record. The meter is not absolutely mechanical or automatic, but it involves the ability of the mind to receive the message as indicated by the telephone and to keep track of that message.

I used this surface method in two or three instances other than the ratings taken at Wood's Landing when I have been making observations in that vicinity. The only other station where I may have used the surface velocity measurement was on Little Laramie river at Dougherty bridge. The measurements there were accompanied by the same high velocity conditions. Outside of these places I have generally used the integration method. I used the two point method at Lookout and McGill stations for checking against the vertical integration method.

#### Cross-examination by Mr. Fred Farrar:

I testified as to the flow at Wood's Landing on one occasion by taking a surface measurement and in this I used a coefficient of ninety. I did not arbitrarily adopt that coefficient. That  
 270 was based on taking the vertical integration method at several points near the stream bank and determining what percentage the velocity so derived was of the surface velocity. I was not able to use my meter in the vertical integration method entirely across the stream at that time. At the point of rapid flow in the stream I could only take a surface measurement. By comparing the measurement, that is, the vertical integration method, which I took near the edge, the coefficient I adopted was taken as the proper one. There might be a variance of the true velocity at the point of cross-section flow of the stream, the one where I was not able to measure except upon the surface, and where the greatest velocity was at the surface. The coefficient of ninety would not give the correct result. Assuming these conditions, the result of my measurements would be less than the total amount of water in the stream.

271 The surface velocity in a stream is greatest immediately below the surface, within a foot, and a coefficient may be 92, or it may be 87 or 86, in some cases as low as 84. In some cases the coefficient might be in excess of 90, but never reaching a hundred. My coefficient of 90 was the best application of hydraulic methods to those conditions. All the high water measurements where conditions are not the very best are at times approximate, it depends upon conditions, they are looked upon as having a certain

amount of latitude. I most decidedly consider that the results of my method where I used the surface measurement and the coefficient of 90 are as accurate as where I am able to measure the velocity of stream from the surface to the bottom with my meter. I meant to say that high water measurements are not as accurate as low water measurements. A variation of ten to twelve per cent could  
 272 be expected at Wood's Landing on the Laramie river at extreme high water there. The total volume of water, as shown by my surface measurement with the coefficient of 90, might be as great as six per cent less than the volume of water which I might have determined had I been able to use the other method of measuring.

Cross-examination by Mr. Delph E. Carpenter:

The charts taken from the automatic register show the diurnal fluctuations of the river during 1913. I have prepared a table for 1913 including August 20th for the Laramie river station at Pioneer dam, showing the flow over the dam below the Pioneer canal in which table I have estimated the flow for temporary purposes from August 20th and including August 31st. Exhibit No. 11 is a copy. I have also prepared a table showing the amount of water passing down the stream from the Pioneer dam during 1913 between January 1 and August 17 inclusive. In that table I have made an estimate of the probable flow from August 17 to September 1. I hand you herewith a copy of that table.

(Table is marked Exhibit 12.) In the last column the figures under the heading "Aug." and after the figures "18" on the left hand margin there, appearing in parentheses. They are designated by a capital E and the line of parentheses. I have also prepared a table showing the discharges for the Pioneer canal at Johnston bridge during 1913. That table is complete to August 22. I hand you  
 herewith a copy, Exhibit 13.

274 Exhibit 12 is a copy of that table.

Referring to plaintiff's exhibit B I estimated the runoff for January, February and March as 8300 acre feet for 1912 from the winter records for 1913 for the same period. It appears in the notes on exhibit B. I did not give any consideration to the records of previous years obtained by the United States Geological Survey at the Wood's Landing Station, to ascertain how their records compared with my 1913 runoff records for the same period, for the reason that they are unreliable. They are unreliable because of distortion by ice. I took them for the year 1913 only, because these records are based on keeping the ice from the dam, so we have most excellent records for the winter runoff and also because the winter of 1912 was an extremely cold one, and the run off for that period would probably fall in those figures, both winters being cold. Referring to exhibit B, the lower table, entitled "Monthly discharge of the Laramie River at Pioneer dam near Wood's Landing, Wyoming, in acre feet," I would state that those figures represent the volume of water passing over the dam to users below. It also in-

cludes the water diverted by the Pioneer canal. The word "mean" with its column of figures beneath it simply indicates the mean flow for 1912 and '13 or the portions thereof indicated as ascertained by my figures. That does not purport to give the mean flow for a considerable number of years, but only for these two years. This table was prepared to cover records that I have secured and does not include other records. The records noted are on table appearing at page 94 of the biennial report of the State Engineer of Wyoming for the years of 1911-12, entitled "Daily discharge in second feet of Little Laramie river near Fillmore for 1912," was not obtained at the same rating station that I used in obtaining my records. That station is located approximately two miles and a half above the station at Lake Hattie Supply No. 2 dam, and referring to page 93 of this same report there is a notation of the 1911 records at the bridge at May's ranch, above all large diversions. There are diversions occurring between the bridge at May's ranch and the bridge at Dougherty's ranch. The Bellamy canal is the chief one, Farr or Dry Creek ditch is also of considerable importance and there are several minor ditches.

#### Cross-examination by Mr. Fred Farrar:

There are some diversions occurring on the Little Laramie above the station obtained by the state engineer at May's ranch, but I am not familiar with them.

At Wheatland reservoir No. 2, after the commenced drawing from the water stored in the reservoir, there is both inflow and outflow of water simultaneously. My tables, as shown in exhibit 8, which are produced this morning, giving the volume of acre feet do not indicate the total number of acre feet stored in the reservoir during any one season, but merely the depth of the reservoir on the days indicated. These do not represent the total storage for the season. For illustration, under the date of May 11, 1913, my table shows the volume in acre feet of 78,000; at that time water was being withdrawn from the reservoir and was also coming into the reservoir from the river. The same would be true of any other date at which water might be withdrawn from the storage in the reservoir, and on some of these dates during the winter there was no positive inflow, the headgate was closed. There might be a small amount of seepage.

#### Redirect examination by Mr. John D. Clark:

I kept no gauging station on Fox Creek in 1913. It was omitted because of the small inflow.

#### Recross-examination by Mr. Delph E. Carpenter:

Yes, sir, there was a very small amount of inflow that year.

277       JOSEPH A. WINKLER, a witness in behalf of Complainant.

Direct examination by Mr. N. E. Corthell:

I am a ranchman, living on Sec. 20, T. 12, R. 74, right on the Colorado line: in Albany County since 1886 and with some interruptions since 1880. Ranching all that time.

I know the Riverside Ranch in Albany County, Wyoming, including the King Ranch, the Caldwell and Gardiner Ranch, as well as the Riverside. I know the ditches irrigating that property. Was one of the original incorporators of the Riverside Live Stock Company in 1886, and its Secretary from 1886 until 1907.

278       The Riverside Ranch was my home. It was sold in 1907.

I know Riverside Ditches No. 1 and No 2, also King Ditch, also the Caldwell and Gardiner Ditch, sometimes called the Caldwell Ditch. They irrigate that property.

Riverside No. 1 and the King Ditch were there in 1880. Riverside No. 2 was made in 1884 by enlarging Grann Ditch which was made in 1882 or 1883.

The Caldwell and Gardiner Ditch was constructed prior to 1886, and was there when I went there.

279       The King Ranch was separate until 1903-4, and the Caldwell and Gardiner until the early '90's. The land irrigated from these four ditches was about 13,500 acres. Irrigated principally for hay, also for pasture. We handled about 500 horses, 3,500 to 4,000 cattle and from 3,500 to 6,000 sheep. The business was begun by Balch and Bacon in 1878, and was gradually enlarged until it contained 34,000 acres.

280       These four ditches take their water supply from the Big Laramie, and irrigate lands back to the bluffs on both sides, largely covering a tract 12 to 14 miles long and averaging from two to four miles wide.

We began to irrigate about the first week in May, as soon as the ice went out and continued until the water would freeze. Sometimes it would be the first week in October and sometimes the first week in November.

281       The result of the application of the water was a large increase in the production of both hay and pasture. It was not originally meadow land. The greater part was second bench lands. There is bottom land then next above that first bench and next above that second bench. Besides cutting hay we irrigated for pasture. We pastured our cattle on the meadow land in winter and fed them hay there. Put in our beef cattle shortly after haying about September 15 to October 1, and the stock cattle later, in October. Kept them there until the grass came in the spring, May 1 to May 20, according to the spring.

282       The cattle were off of the meadow from May until the middle of September. There was a similarity as to methods of handling meadows all along the river. I ranched 4 years in Idaho and other places in Wyoming. Have been over the Riverside Ranch since 1907. Was over it last Sunday. I don't think they are getting as much water as they did two or three years ago,—

don't have the results, don't have the hay there they usually have.

283 Water has been spread very nearly over all the land we used to irrigate. I don't think they had water this year in North Lateral No. 2.

The ditches don't seem cleaned out as well as when we were there. King Ditch has been enlarged to twice, maybe three times, its original size and extended down to Sand Creek to use Hutton's Lake as a big reservoir. No water has run into Hutton's Lake yet through this canal. They began this work in 1911.

284 Completed it last year, except a flume. They may have begun in 1910. I have been acquainted with Pioneer Canal since 1880 and knew of irrigation through that canal by the Riverside Company from 1886 to 1892 or 1893.

The land irrigated lies between the Big and Little Laramie Rivers and North of the old Riverside north boundary. David McCollough and Charles Osterman are some of the settlers on that land. It was unfenced. We irrigated it for sheep. We 285 irrigated about 15 sections of it. We irrigated entirely for pasture. Leased the railroad land from Wyoming Central Land & Improvement Company. Settlers came in and took up the government sections and commenced to buy land from this company.

Cross-examination by Mr. Fred Farrar:

285 Have been acquainted with Riverside ranch since 1880. Company was incorporated in 1886 since which I lived there. My headquarters for winter of 1880-81 was Laramie and from 1881 until 1886 Cheyenne. When I first knew Riverside ranch it comprised probably three sections, irrigated from Riverside No. 1 and the King ditch. These were sections 30, tp. 14, R. 75, we rented a portion of section 36, twp. 14 S. R. 76 W. I am speaking about 1880 now. The other lands used I don't think they owned then.

Section 1 was irrigated, probably 7/8 of it.

286 From Riverside No. 1 ditch they irrigated sections 30 and 1 and they went through part of sections 36 and 35. Section 1, township 13, range 76, I think. They own that section now but they did not in 1880. They bought a large tract of railroad land in 1884. I do not believe they leased it in 1880. But they irrigated it and used it for pasture. I will try to indicate the lands added to this ranch from time to time. I can give you the number of bottom sections. I could, with a map, tell you just what sections they bought, but on the bottom they bought the east half of section 3, township 13, range 76. There was something over 34,000 acres of deeded land. The company sold out in 1907. I will give the bottom lands, starting with those in township 13, range 76. The east half of section 3, tp. 13 R. 76, 160 acres; and all section

287 1. That would indicate that all of the bottom lands that would be in township 13, range 76. None of these lands were owned by the Riverside in 1880. They were acquired at different times between 1884 and 1904. These particular lands I



have mentioned were in the first contract I have mentioned that we took in 1884. These lands were irrigated from the King ditch. The east one-half of section 3 is owned by the company, but the south one-half of the east one-half is hilly rocky country that cannot be irrigated. Only about 25 acres in the east half of section 3 can be irrigated. That was irrigated first from the King ditch in 1880. It is still irrigated. Between the ditch and the river it is good hay land. When I was living there and after, this was acquired, hay was cut from it. Section 2 between the King ditch and the river was irrigated. Some of the north side was irrigated from Riverside No. 1 and everything north of the river is irrigated from Riverside No. 1 and No. 2. Originally about 25 acres irrigated. They are using that land between the ditch and the river for pasture now, but I think they cut hay there two years ago. I could see where they raised a crop of stuff that they cut there two years. I think it was oats and some hay. Section 1, same township and range, practically all irrigated that could be. The extension of the original King ditch went through the north half of the section. They afterwards dug a branch that went out to section 6. It went through section 6 in the north half and into section 5, and at the present time it is extended further than that, and goes through section 4 and to Sand Creek. In 1886 I filed on the north half of section 6 and bought an interest in this ditch and took out a ditch to prove up with.

289 Probably seven-eighths of section 1 was irrigated when I left the Riverside. These three sections comprise all the bottom land on the ranch in township 13, range 36. This bottom land on section 1 was irrigated. Along the south edge there was some alkali and greasewood and we had a ditch through it and some grass growing.

Tp. 13, R. 75 W. sec. 6. I own the north half. I proved up on that and sold it to the Riverside. In 1889 I filed on it in 1888. It was irrigated in 1886 from a lateral out of King ditch. I bought a quarter interest. In 1886 and 1889 we irrigated practically all of the north half. That is bottom land. Section 5 was a part of the King ranch and when it was bought by the Riverside then they acquired the title to that, I think, in 1904. It is irrigated from the King ditch. I have known it since 1880. That was first  
290 irrigated, to any large extent, by seepage from my ditch that ran down there from the King ditch from 1886 to 1889.

The water seeps there and irrigates quite a bit of the north half of it. A little more than the north half is bottom land. Section 4 was filed on about 1904. That section has never been acquired by the Riverside Ranch Company, but has by the present owner. They proved up on it and raised crops on it. They had an extension of the King ditch about 1904. At the time they bought the King ditch the ditch was extended down to it. The Riverside includes no other land in that township and range. That is all the bottom land they own. They owned a lot of range land that went south and west.

Township 14, R. 75, they owned all of sections 31, 32, 33 and 28,

the south half of 21, all of 29, 39 and 19. That is all in township 14, range 75. In 1880 the original ranch buildings were  
 291 on the southeast one-fourth of sec. 36, Tp. 14 N., R. 75 W.

They leased that section and some time in the early '90's they bought forty acres from the schoolboard that the buildings were on and leased the balance of the section. Sec. 30, Tp. 14 N. R. 75 W. was part of the original tract. It is on the north side of the river. In 1880 that was about all they owned. In 1884 they bought this railroad land, from the Wyoming Central Land and Improvement Company. They got it from the U. P. road. I am not able to state the acres under irrigation in 1880, there are about 14,000. There were more than 9,108 acres irrigated in 1910. The Riverside proposition takes in these ranches, the Caldwell and Gardiner and section 29, the Le Roy section and the King ranch.

292 No increase of land under irrigation since 1910. Most of the bottom land is a good sandy loam and has a slight gravelly wash and when water is put on it a good sod grows and the gravel disappears. These sections referred to are all principally bottom, devoted principally to hay and pasture. The bottom land was the land at about the same altitude as the river, close to the river. Then at a short distance from the river comes a slight bench and this big flat that we used to call the upper and lower flat, that is on top of this bench. That is the bench upon which they cut hay. Since this new company has taken it I think they have put some new crops in in the way of oats, alfalfa, peas, etc., perhaps a large part of the section. That sort of business has been initiated within the past few years. In the early days we irrigated the pasture. That

was part of the bottom land, section 1. We did not cut  
 293 hay there because we had to have a place for our work and saddle horses and bulls. Section 1 would probably have cut 100 tons, or something like that. Some of the other pasture lands—the Culver place,—was a good deal better hay land. Some years we would pasture that and some years we would cut hay there. We cut as much as a section and a half, perhaps, in 1880. That was enlarged as they acquired more land.

After we got the King place and the Le Roy place we would cut about 17 or 18 hundred tons from our irrigated land, about 14,000 acres. D. C. Bacon was president and manager of the River-  
 294 side Livestock Company and I was secretary. A. C. Jones was the treasurer. Its headquarters were Laramie, Wyoming.

When we began irrigation we took the first two ditches that were taken out, the King ditch and the Riverside No. 1, and we gradually extended our irrigation by laterals and other ditches like Riverside No. 2, until we could practically cover all the land irrigable. There were some sloughs close to the river that used to be irrigated from overflows. The water was distributed from the ditches by use of laterals and headgates and finally even out onto the little plow furrows from the laterals. We used all the water we could. Water was applied very freely. We did not let our ditch loose and allow it to run because we had to change it on account of shortage of water.

We commenced to cut hay the last of July or the first of August

295 When we began cutting hay we let the water run through  
the main ditches and closed the laterals. It ran into the  
river. Even when irrigating the water was coming back  
into the river. There would be some seepage from the hay land.  
On the south side of the river we irrigated land at the narrowest  
place, 10 or 15 acres, and the widest place, a mile. On the north  
side it goes back more than two miles in places. Both of the sloughs  
are below this flat that we called the upper and lower flats. It would  
be right close to the river and usually running along in the same  
course as the river. The natural drainage was from these ditches  
towards the river. The soil in the first bench, a light sandy loam,  
gets heavy after enough water. There is a light gravel on top that  
after we irrigate sinks out of sight and forms a very heavy soil,  
but it is what we call a light sandy loam. At places on the  
296 bench there is practically no good soil at all. All the gravel  
sinks out of sight after you irrigate. We had to plow the  
good soil for our ditches. We turned up some gravel, but prin-  
cipally good soil. We turned the gravel over, the gravel was on top  
the good soil. Section 26 had round boulders on it and they all  
disappeared as soon as we got the water on it and sunk. The boul-  
ders seem to sink down into this good soil on the flats. If given  
plenty of water, these boulders ten inches in diameter would dis-  
appear within three years. These boulders are there today  
297 as they were originally.

On the bottom lands the soil is a little heavier than the  
soil on the first bench on account of having been washed in there  
and it is a little different soil,—it is a heavier, blacker soil. There  
is a certain proportion of sand with it principally leaf loam and dark  
soil. We dug a deep ditch, two or three feet deep, in river bottom  
soil in several places. In cutting through the bottom land there  
seems to be a good deep loam, varying in depth. Some gravel  
but not much. I don't believe the gravel predominated in the sub-  
soil. I was manager of the ranch for a good many years.  
298 Mr. Bacon was general manager and I was working under  
him as secretary and working with the Live Stock Company.  
I do not believe I am mistaken as to the number of acres irrigated.  
I went over every foot of it with this surveyor, Mr. Buck, who made  
these maps. (Witness refers to maps in his hand.) With all my  
experience covering a number of years I am unable to state what  
the sub-soil on this bottom land is.

There were wooden headgates, raised with a wheel in Riverside  
No. 1 and No. 2, the King Ditch and the Caldwell and Gardiner  
ditch. They had dams built of rock, brush and soil. That was  
true of all four of them. The dams would wash out once in a while  
and we would have trouble with high water. A small proportion of  
the bottom land overflowed in the eighty-nine and early nine-  
299 ties, but so much other water was taken out before the en-  
largement of the Pioneer and before a good many other  
ditches were taken out subsequently. The Riverside sold these lands  
in 1907, I think. They sold to Mr. Ross, Mr. Ross to Mr. Haley

and Mr. Haley to the present owner. The present owner acquired it in 1908. I was on the land a short time ago this season. The last time previous was July, 1912. I bought some sheep there in the spring. I was there several times in 1910 and 1911. I have seen these lands practically every year for the last few years. The last two years I have noticed a deterioration in the method of farming. In July, 1912, I noticed that the ditches were not being cleaned. I also noticed it last Sunday and Saturday. Some of the laterals are being neglected. The quantity of hay cut is very much less than it used to be. All ditches and laterals originally there are still there. I think one Ware, I forget the party's name who was before him, farmed the land the last two years. The Northwestern had another man there. He was farming to show what the land would produce. They sold some land to colonists.

On the ranch are: the home ranch, the iKng ranch, the Le Roy ranch, which is section 29, and some buildings on the Caldwell. Outside of the buildings on the home ranch, they are not what you would call complete sets of buildings, except the home ranch and the King ranch. The King ranch has a house, bunk house and a barn, and the home ranch has a good many buildings. Two different families *are* living on the home place on section 36 in 1913, and some people on the King place, section 32. There is one family on 32 and the Drum family on 31. Four families are now living on the Riverside ranch. The area of this ranch is about 34,000 or 35,000 acres, but in the past two years there has been a great deal of this land that has been sold to speculators. During the time that I was connected with the company the people that lived on the ranch were, the Riverside people, Mr. Bacon and myself in the house and the housekeeper and various men in the bunk house, according to the season, from 10 to 26, and the foreman had his wife and family. That would be the home ranch. That was from 1886 until 1907. The number varied. At one time there were quite a lot of people living in the big house. On the balance of the ranch there would be the family at the King ranch, a man, his wife and four children, and then an old man lived on section 29 before we acquired it. He was a bachelor and had one man, sometimes two or three haying with him. Some people lived on the Caldwell and Gardiner, on section 2, Twp. 13, R. 76, a man named 302 Mulhern. We bought him out. That is all of the families that lived on the entire ranch. No crops are grown upon the Riverside ranch except hay. When I was there as foreman we did raise some oats, some field peas and potatoes. In 1902, the year after Mr. Bacon died, we began raising crops there other than hay. On the King place they had been raising right along, garden stuff and potatoes, but it was raised by Mr. King and not by the Riverside. King would put in three or four acres of field peas. In 1902, on the Riverside, we put in field peas on section 25 and potatoes on section 2, Tp. 13, R. 76. Section 25 was in Tp. 14, R. 76. We cut the field peas for hay. We had about ten acres. We had about 303 three acres of potatoes. I think the first oats, about ten acres, were put in on section 2 in 1902 or '03. That same acreage was continued for three years of oats, field peas and

potatoes. Peas were raised solely for our own use. After that the place had been sold to other parties. In 1907 or 1908 this company broke a desert land claim on Sec. 4, Tp. 13, R. 75. In 1913 there was no crop on the Riverside outside of natural hay. There were oats put in last year by people who bought this ranch. On Sec. 30 these oats are growing today and on Section 31 quite an extensive piece of oats, but I don't think the company put them in. I think on Section 31 there would be about 40 acres of oats and on section 30 about 25 or 30 acres. This ranch at all times has  
304 been devoted almost entirely to livestock. It has not been a farm.

I will give the irrigated land in this tract. The highest township on which the ranch commences is Tp. 14, R. 76. In that Sec. 34 is practically all irrigated from Riverside No. 2. Sec. 27, 160 acres, Riverside No. 2. The south four forties. Sec. 26, three-fourths of the section, all lying under the bluff, Riverside No. 2, all of Sec. 35 north of the river, practically all the whole section; Riverside No. 2; a part of the southeast quarter was irrigated from Riverside No. 1. Sec. 24, Tp. 14, R. 76, about 300 acres in the south half; irrigated from Riverside No. 2, everything below the bluffs there. Practically all Sec. 25 from No. 1 and No. 2; No. 1 principally. No. 2 joins No. 1 in Sec. 25. Part of the east half and part of the southeast quarter of Section 25, 14-76 is under No. 1. All of 36 across the river, on the north side of the river about 160  
acres. That is irrigated from Riverside No. 1.

305 There is in 36 on the south side about 40 acres. That lies in the southeast quarter of 36 and is irrigated from the Highwater ditch. I have given all the irrigated land in that township. In township 13, range 76, there is about 15 acres in section 3. About 160 acres in section 2, lying between the King ditch and the river. On the north side of the river in section 6 there is about 90 acres irrigated by the Riverside No. 1. Section 1 is practically all irrigated.

306 In Tp. 14, range 75 there is about half of section 19 irrigated from Riverside No. 2. All of section 30, lying north of the river, Riverside No. 2 and No. 1. Riverside No. 1 and No. 2 come together right close to the township line and then there is water from both ditches, but is carried out from a lateral on 19 and then between section 20 and section 29 to the corner of section 29. Practically all of 20 north of the river is irrigated. Practically all section 31 is irrigated. All of 29 that is north of the river up to the line of 20. The ditch follows the line between 20 and 29, about half of the section, 320 acres. That is irrigated from the combined Riverside No. 1 and No. 2. The other half of section 29 south of the river used to be irrigated by natural overflow and highwater ditches. Now it is irrigated from the King ditch. There is a half section there. All section 32 is irrigated from the King ditch and the Caldwell and Gardiner ditches come through that section and irrigate a small part of 32. 32 is practically all irrigated. There is little over half of section 21 that is irrigated from the combined waters of No. 1 and No. 2, which meet in that section



and go into the river. The north and west half of 31 is irrigated. About  $\frac{3}{4}$  of Section 28 is irrigated, and from the Caldwell and Gardiner and the Hogue and Haley ditches. Section 33 is irrigated from the King ditch which empties into a lake in that section. Section 15, about 100 acres, irrigated from the Caldwell and Gardiner ditch. A small part is in the southwest quarter and the balance follows the river, on the south side of the river, about the center of the section, going towards the northeast quarter. Section 22 about one-half of that section is irrigated and from the Caldwell and Gardiner ditch. It would be the northwest part between the ditch and the river. The Hogue and Haley ditch goes through that section and irrigates some land in the southeast quarter. In section 27 there is about 160 acres in the northwest quarter irrigated from a branch of the Caldwell and Gardiner ditch. In section 23 the Hogue and Haley ditch irrigates about 160 acres. In section 14 the northwest quarter lying south of the river is irrigated, 160 acres, and 10 acres across the river, irrigated from overflow from the Fisher's ditch. The land south of the river is irrigated from the Caldwell and Gardiner ditch. In section 11 there is 308 about 180 acres irrigated, parts of the east four forties and across the river it is irrigated from the overflow of the river. Altogether probably 100 acres. Section 13 the northwest quarter is irrigated from overflow and seepage from the ditches above the Bush ditch and some overflow from the Caldwell and Gardiner ditch, there is about 50 acres. Section 35, I don't know whether you are interested in it, it is not irrigated from the Big Laramie river. It is irrigated from Sand Creek. We cut hay there. It is along Sand Creek and it would be in the east half. I included it in my estimate of 14,000 acres. Very nearly half of that section was irrigated. We owned section 25 but it was not irrigated, it was used for pasture and was pretty rough. We never put any hay on it or tried to. In Twp. 13, R. 76 N. the north half of section 6, from the King ditch. The north half of section 5, 160 acres irrigated from the King ditch. I don't know that I can tell you the amount of section 4 that was irrigated, because it was taken up and an extension of the King ditch put on it after I left. It was patented after 1908 and it was irrigated from an extension of the 309 King ditch and they raised crops on it after 1908. It was a part of my 14,000 acre estimate. They irrigated three fourths of it. That constitutes all of the Riverside ranch so far as I know. I have given you the maximum amount of land irrigated. After the death of Mr. Bacon, Mr. and Mrs. Emmons bought the Bacon stock. There are a few cases on the irrigated lands on the Riverside ranch where it is necessary to let the water stand in order to get water on the high places. But not to a large extent. There is seepage that forms in these sloughs. There are sloughs 310 that fill up, I think, from seepage. The land which has been seeped has increased. We have been troubled very little with seepage water, most of it goes back to the river through the sloughs and does not cover an area. Take it as a whole, a large part of the water turned onto the land by the ditches goes back to



the river. There is very little alkali on the ranch with the exception of the southeast side. On these greasewood flats there is some alkali, but we don't irrigate them, and very little of what is included in that irrigated land. There is a little alkali on sections 1 and 6 and a very little on the north half of section 6. There is some in the south forties of 1. The water goes on it and makes some feed. The grass seems to grow some.

Cross-examination by Mr. Delph E. Carpenter:

A crop of oats was out on that portion of Section 4, Twp. 13 N., R. 75 W., which I have mentioned as being under the ditch. As far as I know, I don't know of any hay being cut there outside of these  
oats and alfalfa that was started there. It was never irrigated until after 1908 or '09. That did not go to make a  
part of the original ranch that I managed. It was taken up in 1906 or '07. Mrs. Emmons took up half a section. Mr. Hishey the other half. They took an extension of the ditch to put on it as  
as soon as they filed on it, but my memory fails me as to what year it was. No hay was cut off the north part of section 5 that I described as being irrigated. It is a rough piece of land, was irrigated for hay, and makes good feed. North half of section 6 would vary. We usually put up three or four good sized stacks, averaging about 20 tons to the stack and some years about three or four. In running this extension of the King ditch to prove up on section 6, we took our laterals and put water on every forty of that north half, so we could irrigate both north and south. We followed the highest ground we could and got water on every forty of that north half of 6. It was practically all irrigated. It was irrigated in 1887, '8 and '9. I took it up in 1886 and proved up in 1889. Between '86 and '89 it was all irrigated. We could not irrigate in one season the whole business, but we did before we got through. I do not know how near to the surface the water plane is on sections 24, 25, '6, and '7 in Tp. 14 N. R. 76 W. I know that it took a great deal of water to irrigate it on the start and after that it took less. Those sections along the bluff I think have been pretty fairly irrigated, but I don't know how deep you would have to go to strike water. When the ditches are running the water is right there, but in the winter I don't know how deep you would have to go, I never tried. All of these lands that I have described as being irrigated, with the exception of that over on Sand Creek, section 5, Tp. 14, R. 75, all the rest of them lie right down in the floor of the valley of the Laramie river. None of them lie on what we  
call the second bench. All through these lands that I have described as irrigated, there are evidences of old waterways of high water in the river long before men came to the country. What we call the sloughs were right along close to the river itself, what you might call where the river has changed its course, but not out on these flats, you don't see anything of that kind there. The depressions are not to any extent on these flats. They are pretty smooth with regard to slopes toward the river and very few depres-

sions of any extent, nothing that will hold water. There might have been a river cut through these flats thousands of years ago, but they are very smooth and flat outside of close to the present channel of the river. Even in our meadow lands, in some of them that I speak of the soil is thinner than in others. The nearer you get to the river the deeper the soil that has been washed in there. It is better soil and a good deal deeper and the further out you go the lighter it becomes and contains more sand and is a little different quality of soil than this close to the river. Back toward the toe of the bluffs the soil is thinner and more gravel and sand in it. Near

314 to the river it is quite flat. Outside of its being out up close to the river by these little sloughs it is level.

On the second bottoms there naturally grows a little short buffalo grass and cactus and in some places before we irrigated there was very little grass even. There were no natural hay meadows. Even where we have irrigated the meadows do not run in one uniform body all down the valley. In a place of this size they vary a great deal. To one standing on a bluff and looking down at them, they would appear spotted. Where the grass is growing in the meadow there is a darker green and a lighter green where the pasture lands lie. In these places where our meadow grass grows the production varies quite materially. Some places you might cut as high as two or more tons to the acre, whereas in some other places you might have to cut over four acres to get one ton. After the first two years of irrigation a growth of blue stem comes and by increasing the water supply that blue stem will change into wire grass and make very good sod and what we consider a good quality of hay.

315 I wouldn't say what production we obtain from any particular spot, but it wouldn't average a ton to the acre on all the land we cut. Year in and year out, it would average 1600 tons and we would cut 3200 to 3500 acres. The rest of it wouldn't pay to cut for hay.

We would pasture on an average of at the outside about 4000 head on this 13,500 acres from October to May. That included the feeding of all our hay. We used to feed steers for beef and then stock cattle. We had the place cut into these different meadows and pastures, practically ten different fields. If the stock cattle needed hay we put them in and feed them and turn them down on the Caldwell. Towards the last we used to sell the calves. We ran these cattle out on the high railroad lands to the south of this ranch in the summer time. We brought them into the ranch and they consumed the pasture and the hay during the winter. The sheep would get some of that hay in storms, the cattle wouldn't get it all; and the mares and colts would get some. Our cattle did not run short of feed just before we turned them out on the range in the spring in some seasons,

316 because we did not put them all in this field. A lot of the young cattle would stay out in the big pasture. The big pasture was then largely Government land, every alternate section. A good part of our stock would run in the big pasture or less all winter and keep in good order.

We had two bunches of sheep. We ran one bunch south and the other north of the ranch before that country was settled up. In good winters some of the young cattle would never be fed, but would run out all winter. They would stay in this big pasture and down in the Caldwell, some in both places. We usually fed all of our hay right on the property, although every spring more or less was left over. We never sold any unless a neighbor might get short and buy a hundred tons or so. If we had any hay left over we would keep it.

317 Cross-examination (cont'd).

Mr. Fred Farrar:

The hay meadows are river bottom lands and what we call the first bench. The first bench is practically river bottom as compared with the general country. That is true of the Laramie river. The upper country produced an entirely different natural vegetation.

317 Redirect examination by Mr. N. E. Corthell:

The second bench in its natural state produces very little, and that is different vegetation from that on the lower lands.

318 There was a yearly increase in productiveness since we started irrigation. At first there was an overflow each spring which would naturally irrigate a good deal of land. From the early '80's up to the early '90's a good many ditches were taken out above us, and from then on we ceased to have the overflow. Our ditches were all low water ditches and we had plenty of water. Occasionally there would be a year when not so much water came down and we would be short of water. I assisted Mr. Buck in making a survey in 1901 or 1902, to ascertain the acreage of irrigated land.

319 My estimate is made from the knowledge gained at that time. The Hogue and Haley Ditch is taken out on Sec. 29, Tp. 14, R. 75. It irrigates part of the Caldwell property and the Hogue Ranch. It was built in 1893 or 1894. The Denver-Laramie Realty Company, purchasers of the Riverside Ranch, have sold a good deal of the land in tracts of from 40 to 160 acres. Sand

320 Creek on the maps is a tributary of the Laramie. I have known it since 1880. It flows into Hutton Lake. Very little of its water finds its way to the River except in high water. Don't think any of it has reached the River in the past ten years.

Recross-examination by Mr. Fred Farrar:

320 The water from Sand Creek would naturally go into Hutton Lake if not diverted. Hutton Lake is now used as a storage reservoir. I suppose the water of Sand Creek will be used for irrigation if they finish their system there.

Recross-examination by Mr. Delph E. Carpenter:

This new system will use this Sand Creek water through the Hogue ditch. Mr. Hogue had an old water right that took all of Sand Creek

for his meadow, lying north and west of Hutton Lake. The water ran into the lake after it had passed over his meadows. The lake would hold it all, and they are contemplating now building this lake up in order to hold this water from the King ditch that they intend to put through there into that reservoir. Mr. Hogue's ditch from Sand Creek runs into a little stream called Antelope and through the channel of the Antelope it goes into Hutton lake. The water of Sand Creek did not naturally go into Hutton lake. After that water had gone into Hutton lake it stayed there. Do not know whether or not it evaporated, the lakes have not overflowed. I am not sufficiently acquainted to know whether any ditch is taken out of it at this time. I haven't been there for a number of years. Five years ago there had been no ditches taken out of it. The water in the lakes which are very deep either evaporated or stayed there. Antelope creek drains into the lake. The people who now own the Riverside ranch have built an extension of the King ditch to irrigate the lands near the Hogue ranch. Also lands east of there. They started that enterprise about 1909 or 1910, I am not sure which, it might have been 1910. The enlargement is of very recent development. They about doubled the old King ditch.

During the years I was on the Riverside ranch the water was never measured out to me in the various ditches by the authorities of Wyoming.

323 CHARLES BENSON, a witness in behalf of Complainant.

Direct examination by Mr. N. E. Corthell:

Am 49. Reside on Sec. 3, T. 13, R. 76. Am a ranchman. Have lived in the vicinity since 1886.

Was employed as foreman of Riverside Ranch from 1893 to 1911. Know the King and the Caldwell and Gardiner ranches. They are part of the Riverside.

324 Knew the properties before I went there. Know the system of ditches and irrigation there, and also the Hogue and Haley Ditch. The latter irrigates the Hogue Ranch and part of the Riverside. Since I have known it the Riverside has produced some little grain, but mostly hay, and quite a good deal was irrigated for pasture. 13,500 acres and some acres in the ranch were irrigated.

325 It was irrigated before I came there in 1893. We cut 1600 to 1700 tons of hay. I had charge of that. Cut over about 3200 acres. The rest of the land was used for pasture and some little farmed. The ranch was used to run 3500 to 4000 head of cattle, about 5400 head of sheep and about 500 horses. We fed them there in the winter, and in the summer had them out on the range.

326 You can get a good many times more feed off of the irrigated portion than off of unirrigated land. This hay and grain would not grow there without irrigation. I have known the land the last two years. It has not been irrigated as well as previous to that time. There was a shortage of water this summer, and usually

a shortage in previous years during the latter part of the irrigation season. The ditches on this ranch while I was there were kept cleaned out and in good condition to run water. We run them to capacity when we could get the water.

327 The ditches have been neglected somewhat the last two years. There were extensions made when I was there in 1897 or 1898, no enlargements. A new ditch in the N. E.  $\frac{1}{4}$  Sec. 29 was taken out in 1903, and a new lateral from the King Ditch that waters the S.  $\frac{1}{2}$  of S. E.  $\frac{1}{4}$  of Sec. 29. This new work was in the Le Roy Ranch.

328 That was added to Riverside in 1898. The land was irrigated by flood waters before whenever they could get a flow, but not by ditches. That was Mr. Le Roy's method of irrigating. There is not the water in the river there used to be years ago. That is what made the change of method necessary.

I know the recent extensions in the King Ditch. It was enlarged and a branch has been taken off running southeast through Sections 1, 6, 5, 4, 34, 35, 26, 25 and 30.

329 It empties into Hutton Lake which has been made a reservoir. This ditch is intended to fill it. The extension was made in 1910 and 1911. It still lacks a flume across Sand Creek. I own the W.  $\frac{1}{2}$  of Sec. 3, T. 13, R. 76 and the S.  $\frac{1}{2}$  of S. W.  $\frac{1}{4}$  of Sec. 34, T. 14, R. 76.

330 That is on the river above the Riverside property. The land above me is used for hay and some grain, practically the same. 240 acres of my ranch has been irrigated ever since 1884. Most of the land adjoining the river above me has been irrigated. Mr. Olson has been raising oats on Sec. 33-14-76 for a number of years. He has 80 acres of oats there this year. All of this irrigation is with water from the Laramie. The method of irrigating

331 used and the crops raised on the Riverside are similar to those generally in the Laramie Valley.

CHARLES BENSON.

Cross-examination by Mr. Fred Farrar:

331 I first saw Riverside ranch in 1888. I was ranching on the Little Laramie river and had been in this country about two years. I came from Dakota. I have lived in this country since 1886. I have lived on my present ranch about two years and since I ceased to be employed by the Riverside company. I bought part of my ranch from Conrad Hammond and the remainder from the Denver-Laramie Realty Company. The latter was part of the Riverside Ranch originally. It was irrigated for hay land when I bought it and there was then quite a lot of hay on it. It was all irrigated. The best of it was cut for hay from year to year. I have improved it some. I don't cut all the section. There is some willow land and young cottonwood trees on part of it. I cut half a ton of hay to the acre. I cut over 74 to 75 acres and I get about 35 tons. All of this tract is under irrigation. A portion of the lands I own, the southwest quarter of section 3 is upland. It cannot be irrigated un-



less a person puts in wheels or something of that sort. It cannot be irrigated from the river very handy. It is up on the hills to the south of the river. In section 3 I have 160 acres under irrigation.

On the south half of the southwest quarter of section 34 all  
333 of the land is under irrigation. There is some little brush land next to the river and trees that would probably take in 4 to 6 acres. There are practically 200 acres under irrigation. I cut hay on all of this 240 acres. I have 160 acres under irrigation on section 3. I cut hay on that with exception of 9 acres that I irrigate. I have 9 acres of oats. I cut hay on about 75 acres in section 3. I have farmed there just two years. Other than hay and oats I have raised potatoes for my own use, about two acres of potatoes every year since I have been there and some garden stuff in land along the river that is not hay land. In 1912 I obtained  
334 450 bushels of oats, about 58 bushels to the acre, off of this land. I do not have any crop on section 34 this year. My ditch is on between sections 3 and 34. The Con Hammond North Ditch. My buildings are on the south side of the river,  
336 my land on the north side and watered by the Con Hammond ditch. The land on the south side is watered by the Con Hammond south ditch. I should judge about 60 acres are watered to hay by the latter ditch. I cut about 22 tons on this 60 acres.

As to the Riverside ranch, during the time that I worked there I should judge there were about 11,000 acres irrigated to pasture. That was not land from which hay was cut, it was too short and better to leave it stand for feed for cattle. During the latter part of the season the water was short many years. I mean the latter part of the irrigating season, when we irrigate for hay land, that is the latter part of June and first part of July. We were very short this year, we didn't have any water and the Riverside people didn't have any at that time. There was no water in the river in 1913 except a very small seepage from the ditches higher up. That was not true in 1912, we had plenty of water then by tightening up  
337 the dams. We were not short of water in 1888. During the rest of the time I was on the Riverside ranch we nearly always had sufficient water for irrigation. There were times that we were a little short and we had to tighten up the dam to keep the water from going through in a good many years. This shortage of water has been true from time to time since I came to work on the ranch. I could not say that there has been a general enlargement of irrigating lands on the river immediately above the Riverside ranch since I went to work there. No enlargement of these ditches on the river, or extension of any of them above the Riverside that I know of.

There has been an enlargement of the Pioneer canal. I thought you referred to the ditches on the river, yes, the Pioneer canal has been extended. The Sodergreen, taking water from the river above me, has been constructed, and the extension and enlargement of the Pioneer canal. Also the Pioneer enlargement leading to Lake Hattie. That was built in 1910, I believe, if my memory is correct. Lake Hattie reservoir has been built in the last few years and water stored in it. They first began storing water in 1912, this year, 1913, and



last year. I could not say whether they have water in it now. I have not been up there for some time. They have had water this summer there during the flood season. I do not know whether or not they had water during the summer. I was not up there, but I know they had plenty of water in the flood water time.

When I went to Riverside ranch in 1888 they did not use dams to divert water in some of the ditches. They went down at the bottom of the river and didn't have to use dams, but the channel sunk down and they had to build dams later. I built some myself. In 1888 the King ditch and Riverside Ditch No. 2 had a little dam. It had to be built up. The King ditch did not have any dam. It never did have a dam except the temporary one at times. By 339 a temporary dam I mean a dam built out of cottonwood logs, brush and manure. The Caldwell and Gardiner ditch has had a permanent dam for a good many years and it washed down of late years. It had a permanent dam when I was there. The Riverside Ditch No. 1 did not have a dam when I went there. Not even a temporary dam. There is a permanent dam now put in in 1894 or '5. The ditch was changed and taken out higher up. It used to be lower down and didn't have a dam and didn't have water enough. Before it was changed it did not have a dam at the mouth to my knowledge. Riverside ditch No. 2 had a little bit of a dam and part of it washed down. It is not a permanent dam now. It was washed out and there is no dam there now. It washed out the last two years. It has not been replaced.

340 Hans Olson owns section 33, Tp. 14, N. R. 76 W. He raises oats in the southwest quarter of section 33. Mrs. Olson owns the section excepting the west four forties. About 80 acres of what she owns is devoted to oats this year. They have been raising oats there for the last 6 or 7 years to my knowledge, 80 acres is the most they have raised and previous to this time they have had in a less area.

I do not know when irrigation of the Riverside ranch began. It was before I came there to work. I do not know when the irrigation of my land began.

I raise cattle. So do most of the people up and down the river.

Some people have sheep. I am 23 miles from Laramie. 341 22 miles to the nearest station.

I feed the hay I cut to my stock. I turn the cattle during the summer into the Medicine Bow forest reserve. I usually turn out about the 10th to the 20th of May. They generally come in themselves along the latter part of September and first part of October. This reserve lies south and west of my ranch.

The Riverside ranch is about 20 miles from Laramie. The Riverside ranch is immediately below my ranch. My hay land lies mostly north, close to the river. It is partly bottom land and on the first bench. This first bench is not clearly defined, it is merely the first rise from the bottom. It is essentially in the valley of the river. The second bench is where the high prairie land is. There is not necessarily a distinction in the character of vegetation on these benches. It is about the same vegetation. Most any of the second bench will make meadow land if you have enough water on it.

They cut hay on it which will average up with the bottom land, about one-half ton to the acre. The natural growth on the second bench is blue stem and some buffalo grass. Not much sage brush on second bench. No greasewood on the north side of the river. It would probably be a good deal different a good many miles north, a different character of grass and soil and so on.

The altitude of my place is about 7300 feet. That of Laramie is 7,164 feet.

When I was on the Riverside ranch we had laterals for the irrigation of the meadow land. We used to turn the water  
344 on the meadows May 10th. We applied the water freely, but we used to change it, we didn't have enough water to supply all over the land at one time. When we did apply the water we flooded the meadows. I would say we flooded them for two weeks and dried them for two weeks. There naturally would be some seepage from the first bench down on the bottom lands and from the bottom lands down to the river. There would be some water going into the river continuously during the time we applied the water on the land. When we applied these waters on these lands there was a considerable return to the river within a very short time. Water returns to the river from land irrigated within a mile.

Further out I do not know that it would. We did not have  
345 any trouble with seepage while I was working there. There is some seepage. There were 200 miles of ditches and laterals on the Riverside ranch. That included the small laterals leading from the main ditches and the main laterals. The Laramie valley above the Riverside ranch is mostly devoted to stock raising, sheep. The hay meadows are of the same character as on the Riverside. They have, on a general average, hay meadows and irrigated pasture land. The laterals on the Riverside ranch, a good many of them, would be 4 feet wide and a foot deep. The smaller laterals were made with a scraper with a handle on and a man behind follows it up. If it was a very small lateral we would throw the dirt to one side. If it was a two foot lateral on the bottom they would take and throw it out on each side. A still smaller lateral they made by plowing and using this hoe scraper and putting the bank at the low side of the laterals. The smaller laterals would be about two furrows wide. If there would be only one furrow we wouldn't bother with the scraper.

#### 346 Cross-examination by Mr. Delph E. Carpenter:

The ranches that were purchased and went to make up the Riverside ranch were the King ranch, the Caldwell, the Mulhern and the Le Roy. When I began work on the Riverside ranch in 1883 the following sections went to make up the Riverside ranch;  
347 Sections 26, 27, 34, 35 and 36 in Tp. 14 N., R. 76 W. Section 25, Tp. 14 N., R. 76 W. The south half of section 24, same township and range was leased. In Twp. 13, R. 76 W., they had the east one-half of section 3; the north one-half of section 2. That was not fenced. Section 1; north one-half section 6, Tp. 13, R. 75 W., sections 31, 30 and 19, Tp. 14, 75 W. That com-

prises the Riverside holdings at that time. Caldwell was leased by Riverside Company but not owned. Le Roy section was leased then and bought within a year. Le Roy section was 29, Tp. 14 N., R. 75 W. Le Roy owned section 35 on Sand Creek, bought at same time. Shortly after I came to work there, in 1894 or '95. Mr. Bacon bought that. The Le Roy land was part of Union Pacific Railroad Company's grant. The Caldwell place in 1893 comprised the south half section 21; section 28; section 27; section 22; section 15; section 11, N. W.  $\frac{1}{4}$  section 14; section 23; section 13; Tp. 14 N., R. 75 W. This was leased in 1890 by the Riverside people and purchased in 1894 or '95. The Mulhern place comprised N. W.  $\frac{1}{4}$  section 2, Tp. 13, N., R. 76 W. I believe it was purchased about 1894. They tore down and hauled the buildings away to the ranch about 1892. I can give the irrigated land

and some of the range land of the King ranch in 1893. 349 Sec. 32, Tp. 14 N., R. 75 W., and the east forties of Sec. 31, same township and range. Sec. 33 belonged to the King ranch but was not irrigated. Sec. 3 and Sec. 5, Tp. 13 N., R. 75. That is as far as I know south of the King buildings. That was purchased about 1901 or '2. Prior thereto it was run by James King and son. They lived there on north half of sec. 32 close to and south of the line of 29 and 32, about the middle of the section where his buildings are. In 1893 we had nothing to do with the King ranch. I took charge of the Le Roy ranch for the Riverside people in 1894 or '95. Sec. 30, Tp. 14, R. 75 W. is owned by Oliver Mansfield. All irrigated except the four north forties by 350 the Mansfield ditch, a separate ditch taking water from the river. Has its own headgate.

I had charge of the distribution of water for the Riverside people during the time I was there. I began in 1893 and I quit when I left there two years ago. After the irrigation season of 1911 was over. Was foreman in charge generally of ranch. Lived at ranch buildings. In 1893 I irrigated in Tp. 14, R. 76, all sec. 34 to south branch

of Riverside No. 2. South half of Sec. 27 and some little 351 land on north half Sec. 27, about 80 or 90 acres. South half of Northeast quarter Sec. 26 and south half of northwest fourth Sec. 26 and all Sec. 25. All from Riverside No. 2. There is a little land on the east side of 25 irrigated from Riverside No. 1. East half of southeast quarter and probably 30 acres of east half of northeast quarter of sec. 25 is irrigated by Riverside No. 1. The remainder by Riverside No. 2. The northwest quarter of Sec. 36 is irrigated by Riverside No. 2. Northwest quarter of northeast quarter is irrigated by Riverside No. 2, south branch. Some land irrigated by Riverside No. 1 in Sec. 36 on south side of river, about 60 acres in southwest quarter and about 60 in northeast fourth of Sec. 36 on north side of river. There are about three quarters of Sec. 36 irrigated, all except 40 acres on south side of river, by

Riverside ditches 1 and 2 on north side and King ditch on 352 south side. 50 or 60 acres irrigated by King ditch. Riverside ranch people then had half interest in King ditch. In township 14, range 75 west 19 was irrigated except north half of

northwest quarter. It was irrigated out of Riverside No. 2. Sec. 30 from Riverside No. 1, and King ditch on south side of river. Sec. 31 is irrigated. The Caldwell ditch heads in that quarter. Sec. 32 is irrigated from King ditch, some parts of 29 from King ditch in southeast quarter, probably 65 acres. That is part of Le Roy place. Bottom lands on south side of river irrigated by overflow in Sec. 29, north side irrigated by ditches. Riverside No. 2 and No. 1, they joining in there. No. 2 ditch empties into No. 1 in Sec. 19. All land on north side of river in Sec. 29 was irrigated, about 360 acres. Some land in Sec. 33 irrigated by King ditch, but it is not all meadow land, it is grazing land, there has  
353 not been any hay cut. It is all irrigated pasture land except north half of northeast quarter and northeast quarter of northwest quarter. That portion irrigated was covered with water in recent years, not the northwest quarter of northeast quarter. Not to exceed 125 acres was above irrigation on Sec. 33. Mr. King irrigated from King ditch the balance every year for pasture. He used to keep his saddle horses and work horses in there. It is covered more or less with greasewood. The Riverside Ranch Company  
354 did not purchase that until 1906 or '7. Mr. King had an old lateral to irrigated that land when I came to the place. The soil is a kind of gumbo, very sticky when it is wet. Most of the land where this greasewood grows is the same kind of sticky soil. All Sec. 32 is irrigated by the King ditch, all the land on the south side of river in Sec. 31. All of south half of south half of Sec. 32 is irrigated land, there is some greasewood on it and some sage brush. There is a good part of it that has been cleared  
355 off, some greasewood on south part. This sticky gumbo land is called Billings Clay. The south of south half of Sec. 32 is of same character. The Caldwell and Gardiner ditch irrigates the west half of Sec. 28, and all the rest of Sec. 28 except the bluff land on the southeasterly portion. It takes up the south half of southeast quarter. The north half is pretty well covered with water. It irrigates both ways, toward the river and away  
356 from the river. The ditch is in rather high places. Some hay was cut and there was some pasture land south of ditch. It was mostly pasture. Hay was cut in spots where the land was smooth. We would probably cut about 40 tons off that portion of Sec. 28 southeasterly from ditch and about 40 tons from that portion north and westerly from ditch, and between ditch and river. From the whole section about 80 tons. The land between Caldwell and Gardiner ditch and Laramie river, west and north clear to river, was pretty much all irrigated. The river has a great many trees along its course. There was hay cut right up to the trees. We did not dodge in among the trees much, we left that stand.  
357 South half Sec. 21 was irrigated from Le Roy ditch, that comes out of Sec. 29 and partly out of Riverside No. 2, they join at the corner of 20, 29, 21 and 28. That ditch was taken directly from the river into Sec. 21. Was built in 1903 or '4, odd times, and took a good many years to build, four or five years. Completed about that time. South half of 21 is not very low land. By

taking ditch out on Sec. 29 half a mile up river from the corner, we get water on first bench at corner of Sections 29, 20, 21 and 28. On south of Sec. 21 the bench slopes to east and south.

358 There is a ditch there that runs north and you can let the water out and it will run south and east. The ditch has very little fall along the fence, running on line between 20 and 21, runs from river north and when it gets to half mile line runs east along section and if it is let out of these two ditches, it will run east and south. About 200 acres south half of that section were irrigated on north side of river. Some hay cut there, about 35 tons. The rest is pasture. There is about a quarter section or a little less on south side of river in Sec. 21 irrigated by Caldwell and Gardiner ditch. It is pasture and hay land. We would cut about 10

359 tons in that corner. About all Sec. 22, except 60 or 70 acres in northwest quarter was irrigated. Part of it from Hogue and Haley ditch and part from Caldwell and Gardiner ditch and part from Bush and Holliday ditch. Last ditch runs in between the Hogue and Haley and Caldwell and Gardiner ditches. The Riverside Company did not own Hogue and Haley ditch. It was owned by Hogue and Haley. The Riverside ranch used to get lots of water out of the ditch. It overflowed a great deal along these banks, they were good strong banks and they generally used to carry plenty of water so we watered pretty much all that section. Not quite the whole southeast half was watered that way. The Bush and

360 Holliday ditch irrigated a good deal of land on east side of their ditch. The Riverside Ranch did not have any interest in Bush and Holliday ditch. They would make the ditch part of the way and lead it into a low place and use that for a part of ditch and then make another ditch and lead it into another low place and in that way the water ran both ways in the low places and irrigated some of the land in 22. All the land south and east of Bush and Holliday ditch was irrigated either by Bush and Holliday or Hogue and Haley ditch. That was all pasture land. I did not know that Samuel Blackwell held title to that section until 1900. A small part of 23 was irrigated by Riverside Company, about 60 acres in northwest quarter, irrigated from a lateral out of the Hogue

361 and Haley. There is a lateral out of the Hogue and Haley that waters the east half of 14. This land in 23 was irrigated from that lateral. I do not know whether Mr. Blackwell owned Sec. 23 or not. It was under control of Riverside Company as long as I worked there. It was not fenced separately and has always been in same field. That was pasture. Sec. 13 is irrigated partly from the Bush and Holliday and partly from the Hogue and Haley. The Riverside people had control of the section and I believe owned it. East 80 acres was pasture. East half of southeast quarter was

hay land. I did not know that Mr. Samuel Blackwell owned 362 that section until 1900. Whatever irrigation took place in Sec. 13 was from ditches neither owned or controlled by the Riverside Company. We cut about 35 or 40 tons on that 80. It was good hay land. We cut 35 tons, one year with another. They used to get lots of water from the Hogue and Haley. There is a lateral



comes out of the Hogue and Haley and runs the east half of the section, through the corner of Secs. 18, 7 and 13 and 12 and onto Sec. 7, called the Hogue Land. That lateral has only been there the last three or four years. There was no irrigation on 13 prior to the construction of this lateral. There was some water from the Hogue and Haley ditch that slopped over. There was some irrigation and some seepage where this hay was cut, it is kind of a low place. There was practically 80 acres irrigated by seepage and overflow from the Hogue and Haley ditch prior to construction of the lateral. The lateral waters practically to the line on 13 and 18. It waters all this 80 I have spoken about, and then half of east 80 and northeast quarter,—east half of northeast quarter. It goes diagonally across the 80. Probably 35 or 40 acres. That has all been watered since the lateral was built. The lateral is rather deep at that place, you can't get the water out on this 80 I spoke about. The northwest quarter of Sec. 14 has been watered since 1893. That was all in that section the Riverside Company owned. It was part of the Caldwell and Gardiner ranch. It was irrigated by Caldwell and Gardiner ditch. About 120 acres on south side of river. The other 40 acres is on north side. We would cut probably 35 or 40 tons of hay on that quarter section. That portion on north side of river gets its water from Fischer ditch. Nelson had a ditch and it gets some water from that. I don't know whether it is on record or not, but Mr. Nelson has a little ditch on the north side of river. The Riverside Company did not own any part of Nelson water appropriation in Fischer ditch. Whatever irrigation there was on this quarter on north side of section was by waste and overflow or return waters from these two ditches which the Riverside Company did not own. We had no control over that overflow or waste. I did not know that Samuel Blackwell owned that quarter section until 1900. Some land in Sec. 15 was irrigated, about 340 acres on the south and east sides from Caldwell and Gardiner ditch. Some meadow land and some pasture. About 24 tons of hay were cut there. The north side of river was not irrigated. It got some water, I think, from overflow of Nelson ditch. I do not know of any ditch there of late years. We had no control over the waters in Nelson ditch. The river passes from southwest to northeast across section 15. Part of a quarter section on Sec. 11 south and east of the river was irrigated. It was owned by Riverside people. Partly pasture and partly meadow. Quite a little hay land on southwest quarter of section irrigated by Riverside people. North of the river it is a little low land and seeps in there and makes quite a little hay land. The Riverside people owned all 11. The little meadow on north side of river was a natural meadow, but it did not require irrigation. All northwest quarter of 25 is irrigated from the Garden ditch out of Sand Creek. The ditch belonged to Denver-Laramie Realty Company. The land to Riverside. It was a partnership ditch, Hogue and Riverside people owned it. Riverside owned all Sec. 25. All except northwest quarter is pasture. In the southwest quarter there is under this Gardiner



ditch about 45 or 50 acres irrigated pasture land. They could have cut hay there but didn't. It was too far away from ranch. There is some land in Sec. 35. Sand Creek runs through Sec. 35 all west half of that section, barring about 20 acres. There is 20 acres in southwest corner that has no water on account of a bluff. All the rest of that west land has water on it. That was part of Riverside ranch during the time I managed it. There was some hay cut there and balance used for pasture. We cut about 30 tons or more.

367 There was a little more land in section 35 irrigated. I believe we have about covered all the land owned by the Riverside in that township. In township 13, range 75, the Riverside people owned north half of Sec. 6, irrigated from a lateral coming out of King ditch in Sec. 1, Tp. 13, R. 76 and running from Sec. 1 into 6. The ditch also extends through 5 and 4. There was some hay land on this north half of 6. The biggest part of it is pasture. Mostly Billings Clay or adobe. There was also some land irrigated in Sec. 5, about 15 acres of irrigated pasture land. There is a ditch over the land, but it has not been irrigated. Almost the entire 5 is Billings Clay or adobe covered with greasewood. The north half of 4 was irrigated by this same lateral. Was taken up as a

368 claim by Mrs. Emmons in 1903 or '4. Prior to that time it had not been irrigated. All the north half of this section has been irrigated from this lateral, if at all. That was greasewood, Billings Clay land, plowed up since and some grain raised on it. One lot of oats raised on there a year ago by other parties, about 150 acres in oats. I don't know what yield they got. Practically all Sec. 1 was irrigated by Riverside Company, except southeast quarter. There was some land in there not irrigated, and a little in southwest quarter, about 10 or 12 acres. There is a little bluff there. It was used for irrigated pasture. We didn't cut any hay there.

369 Right next to river it is a sandy loam and about a mile out it is adobe clay. A little over three-quarters of section is irrigated. Some high greasewood bluffs. In sections 1 and 2, Tp. 13, R. 76, this Billings Clay soil comes down quite near to river, much nearer than further east. It comes about half a mile from the river along there. This Billings Clay soil is not always indicated by greasewood growth. Some of that clay don't grow anything—greasewood, sage brush or anything, just bare land. It makes good land if it is seeded down. Even then it gets very hard and breaks when wet and exposed to sun. There was some little land in sections 2 and 3 in that township that was irrigated. About 30 acres in

Sec. 2 in northeast quarter on south side of river from King ditch. It is sandy loam and gravel like. Irrigated for pasture. On south side of river about 25 or 30 acres and on north side in Sec. 2. It is irrigated by Riverside No. 2. In north half of Sec. 3 on south side of river about 13 acres watered from King ditch, that is, in the northeast quarter. That is pasture land. On north side of river in that section there are about 50 or 60 acres watered from Riverside No. 2.

These lands constitute all land in any way irrigated by Riverside Company, during my term as foreman. Out of all that land I

have described as irrigated I count over about 3,200 acres of hay land, and cut from 1600 to 1700 tons of hay. Such hay land

371 would average then about half a ton to acre. One acre with another would cut about the same. It is a fact that some of

very favorable spots would go as much as a ton and then sometimes we would cut land that would go as low as a quarter of a ton, making an average on the whole of about half a ton. The garden truck I spoke of was raised on Sec. 32 on right by the King buildings. That was merely the garden for the ranch. The potato patch was just for ranch use. I stated I superintended the irrigation.

We alternated in irrigation on hay land. Let the water run in one place about 2 weeks and then dry for succeeding 2 weeks. There was never enough water to cover all that land at one time. We would cover each spot irrigated four or five times each season.

372 The water that ran in one place for two weeks evaporated and the most part went into the soil and some evaporated and some seepage. I do not know whether it got as far as the sub-soil, but it watered the surface. I don't know whether it went down into that gravel, it went into the land. Most of our irrigation was done on the first bench. The further down the river you go the higher this bench becomes. Up above my place in Sec. 3 it would be about 4 feet up to the first bench and further down on the Riverside in Sec. 36 it would be about 8 feet to first bench from bottom land. From there down the river it would be a little lower again. It would probably be only about 5 or 6 feet in Sec. 30, the highest point there for several miles would be in Section 36-14-76. The river bottom land would be about three feet six inches higher than the river bed in this particular place we are speaking about.

This whole Riverside ranch that I have described in the  
373 Laramie river valley. I could not say whether or not the first bench was made by the action of water in depositing gravel and sand, which was later covered with soil. There is quite a big plat of that first bench, that the land is pretty level. I never did dig down and make wells in this first bench. We dug wells in Sec. 36 about 16 feet deep. We found sandy loam on top and some gravel, and some sand mixed. Then a kind of blue shale, very light shale. That was on south side of river. There was some water in this sand and gravel that we found between sandy loam on top and shale in bottom. I never did excavate on the first bench anywhere on Riverside north of the river. I do not have any idea what the formation is there. The water applied on the north side would act differently in different places. Places that had been irrigated more than others the water would go further. Where the land was more new and had not had so much irrigation, it would take more water and it would sink in more. After the land had been irrigated for several years it seemed to hold water quite well and wouldn't take quite so much water to go over it. That condition generally prevailed on Riverside lands irrigated north of

374 river. I have not noticed that in many places in the first bench north of river and especially over along north edge of our irrigated lands that the water plane is only a foot or so below

the surface, or in other words, that water stands very close to grass roots. I haven't noticed any water, except in irrigation season, seepage from ditches. When the ditches are shut off it is perfectly dry there. I never dug down there to see where the water plane was. Not a great deal of this water run over this irrigated land goes back into the river through sloughs and depressions. Some little runs through the sloughs during irrigation season. After irrigation season is over there is no water in fall or winter running through the sloughs. There is some little while we are applying it. The land on south side takes as much again water or more as those on north side of river. The sandy loam on south side takes more, that strip about a mile wide along river that I have described is very light sandy and gravelly loam. Billings Clay would not take so much; would take very little water. I never did dig down in that strip of sandy or gravelly loam between Billings clay land and the river which is from half a mile to a mile wide, to see what

375 the sub-soil formation was there. I dug several wells on section 36-14-76 at the ranch buildings. At that point the surface is not over 3 or 4 feet above bed of river. On two or three occasions the river overflowed and went through the yard of Riverside ranch buildings. I dug these wells in overflow district. In these wells we found some fine sand and some large gravel, the largest stones would be an inch and a half. Very much like the river wash not quite so coarse as some you see where the water washes bottom of river. On bottom of river the action of the water washes away the fine sand and gravel and leaves the coarse gravel exposed. What we found would be in river if water had not washed away the fine sand and gravel. It washes in parts of river and then

376 heaves up this fine sand and gravel in other parts and you find rough gravel on one side and sand bars on other, making what we call river bars. I do not know that this strip of land on south side between Billings Clay and river has appearance in a good many places of being large river bars covered with some silt. It is pretty much uniform soil so far as I have seen. There are very few sloughs on south side of river. About 2 or 3 sloughs and they are very close to river. There is a slough running northeast right close to buildings at ranch. There are some low places down in vicinity of Bush and Holliday and Haley and Hogue ditches. There is not any water in them except in irrigation seasons. But depressions, a good deal like those we have mentioned, appear more or less over that mile strip, so if at high water it should overflow this land to south it would drain back into river through those depressions.

I could not say how this strip of land between Billings clay  
377 and river was made. It is pretty much same character of soil from river out south and west for a mile or two, little more gravelly toward river. The nearer the river the more gravel. Over in Sand Creek district the soil is pretty much the same character as at Riverside, some clay and some sand.

During time I was forman we ran as high as 4,000 head cattle, 5400 head sheep and 500 head horses at this ranch. We had a very large pasture immediately south and west of river bottom

lands for some years and then we took the fence away and you might call it an open range. I do not know the circumstances that led to taking the fence down. It was taken down voluntarily. Other people were forced by the Government to take their fences down.

Every other section in there was title land. By title land  
378 I mean deeded land that a person buying owns it and has a deed. This title land comprised all odd numbered sections. It was part of land given to Union Pacific Railway Company in its land grant, at the time it was built across continent. The title to it was derived from the railroad. All even numbered sections were Government sections except sections 16 and 36 which were school lands. We took down this fence which enclosed these railroad sections belonging to Riverside and also school and Government lands about 1900 or 1901. There is still some fence standing on south and east side of the pasture, but most of it is piled up in piles on odd numbered sections and some little standing there yet, not on any Government land, but on odd numbered sections. Prior to the time we tore fence down we had in this big pasture  
379 16,000 or 17,000 acres. All was above irrigation. It lay south and west from ranch. The company owned about 8,000 acres, in 1893. There is some land outside the big pasture that we owned, but I wouldn't say how much, on what is called Red Mountain flats, so I might be mistaken as to acreage. I don't know just exactly how much they did have. I have control of about 31,000 acres both in big pasture and in valley part of ranch during my management, from 1893 to when the Denver-Laramie Realty Company bought in 1910. We did not have exclusive control of all land in our fence, other people could turn cattle in there if they felt so disposed, and there was other stock in there besides the company stock. We could not keep anyone from turning stock in there as long as we had Government land fenced. We had some stock on outside as well as in big pasture. We also ran horses and cattle on open range to south of big pasture and up into Red Mountain and Bull Mountain country. We ran all our stock out there during summer months, and until into September, when we would let them into big pasture. It would average from 10th to 20th of May when we turned stock out. All our stock would range and feed both in Valley and on mountains in vicinity of Red Mountain, Bull Mountain and Ring Mountain. We would gather them in September. In early years we had a roundup. In the last ten years we didn't. We would let them come to the gate and keep riding every day and what we found along the fence we would put into field through the big gates. We had a roundup in 1893, '94 and '95. From then on we just gathered them from the ranch. We would gather them and turn them into the big pasture and hold them on the big pasture and on valley lands from September until May. In probably September or October the first snow storm came and we would turn them in on bottom lands where we could take better care of them. They would drift to bottom fences and we would have to take them or they would break down the fence and come in themselves. Our stock would range clear over into

Colorado, from 12 to 14 miles from ranch during summer months on open range. Over on Sheep creek in Boulder Ridge country and McIntyre and on Jimmy creek, a tributary of Big Laramie.

We had some ranches on Jimmy creek.

381 We owned the Otto Graham ranch. That is first ranch on creek from its headwaters down. It is in Colorado. It is at west part or mouth of Sand Creek Pass. We used that ranch to take our calves up there in winter time and feed them what hay was up there. We would generally take our weaning calves up there about middle of February. The Jimmy creek ranch would cut about 125 tons of hay. It would take care of about 275 to 300 calves from middle of February to about 10th or 15th of May.

382 We, in large measure, had control of this large range up to south of our pasture in those years. Some stock men turned their stock in, but not a very large number. Never enough to amount to much.

During summer months we ran two bands of sheep between Big and Little Laramie rivers a good deal, and also up around Ring Mountain south of ranch. Ring Mountain sheep camp was located in Sec. 28, Tp. 13 N., R. 76 W. That was our central sheep camp. We did not have traveling wagons and camps. We didn't use wagons. We had corrals and cabins. We also had another sheep camp or two between the Big and the Little Laramie Rivers. These are in the Big Hollow. The other camp at Osterman Lakes. They are south and over the bluff from the Big Hollow camp.

383 We used to run the sheep there in the summer and fall. In the winter we would take them further south toward the home ranch. Whether we would move them into the ranch depended on the weather and the feed. Sometimes we would move the sheep from the Big Hollow over to the Ring Mountain feeding grounds. We aimed to hold the sheep out on the open range as much as possible during the winter months. In order to provide for their care during storms, if we had them any distance from the ranch, we would take out baled hay and keep there in case of a storm. The ranges were open most of the winter. During 1893-4 and '5 we ran wethers. They came from Oregon. Wool only brought about 5 or 6 cents a pound. After that we ran ewes and raised lambs. That was during 1897 and '8 and from then

384 on until two years ago when we sold out. Wool was a first class price during that time. The wethers were shipped down to Silver Creek, Nebraska, almost every winter and fed corn and put onto the market from there. There was a man named Alex McQueen there and he fed them out on a percentage. We sold the old ewes each fall. Sometimes Fort Collins feeders would buy them. These sheep sold to him were taken there to be fed for the market. We figured on carrying over from 4300 to 4400 ewes each winter.

385 During these years we mostly ran white faced cattle. Each fall we would sell all the dry cows and all the steer calves that were big enough around October and November. All of the fat



stuff generally went to Omaha and some to St. Joe. A good many of the steer calves were sold to Governor Carey for several years. We aimed to sell out all our steer calves each fall. We aimed to hold over only our producing cows that were in good condition. We aimed to carry over each winter about 2400 cows. Along in the late fall or early winter, whenever they would come down and press against the fence on the north side of the pasture and south of valley land then we would let them through into the grazing grounds there. We consumed all hay from year to year with these cattle. Sometimes we would have stacks left, generally some little surplus.

We ranged our young horses around Bull Mountain, Red Mountain and outside of the Big Pasture. The mares we generally kept in the big pasture. During the years I was in control we as a rule had about 140 mares. Our young horses ran on the open range in the Bull Mountain country until they were ready to break. We also had some 70 head of saddle and work horses that we ran in the big fields up until haying time. I mean the big pasture south of the irrigated land. We generally had about 300 head of young horses on the open range. The proportion of horses kept in and turned out would run about the same in the years 1893 to 1910 or '11. We shipped some horses every year to get rid of the surplus.

This open range country to the south of the ranch was a good range country. Other ranchmen turned out there but in the use of the range and the big pasture the Riverside company had the biggest proportion of it. The other ranchmen had small holdings as compared with the Riverside company. These smaller holdings were mostly held around the little ranches of their owners. The big pasture to the south was left open during winter so that the stock ranged up in that region more or less during the winter. There is some quaking asp land along Bull Mountain, Jelm Mountain and Red Mountain, and the horses browsed the quaking asp more or less in the winter months. There was also a good deal of grass that we didn't cut, pasture land, among the brush, and along the river in the shelter. It was utilized in the winter by our cattle. The cattle will pick at the greasewood some when it is green, but generally it is not regarded as of much use.

The largest field of oats we ever raised on the Riverside ranch was 137 acres in 1910 and '11. That was after the Denver-Laramie Realty Company bought it. They had an idea of converting this Riverside stock ranch into a colonization scheme. They did not get a large crop, about 2800 bushels. These oats were irrigated. They were raised on Section 24 and 25, Tp. 14 N. R. 76 W. I had charge of their raising. This Denver-Laramie Realty Company was an auxiliary company to the Denver, Laramie and Northwestern railroad company.

During the years prior to the Denver-Laramie Realty Company's promotion effort I did not raise any oats while I was foreman. We did not feed any grain prior to the ownership



of Denver-Laramie Realty Company. We had horses enough to change and never fed them any grain. We did not feed any grain in fattening our animals, excepting a few hundred lambs we used to buy corn for. It was shipped in from Nebraska. We did not raise any wheat or barley during the years I was foreman and prior to the Denver-Laramie Realty Company's efforts at promotion. In 1910 we did raise a little wheat and barley on Sec. 1, about 30 acres in wheat, barley and field peas.

391 While I was running the ranch for the Riverside people I did not pretend to cultivate except for our garden and potato patch. All the rest we used for hay. That is its most valuable crop. The greatest value is obtained from this ranch by the use that was made of it during my management of it from 1893 up until the Denver-Laramie Realty Company purchased it. It was at that time nothing but a stock ranch.

In 1893 and at present the Riverside canal No. 2 is about 8 feet wide on the bottom, will carry water 2 feet and one half in depth, has a fall of about 3 feet per mile and I do not know its carrying capacity. It diverts water from the Laramie river below Oscar Sodergreen's house, and above Charlie Sodergreen's house. It has the same headgates and diverting appliances it always had. It then had and now has at its head a crib dam, filled with rock. It has and had a headgate but no measuring weir. We didn't measure the

392 water.

In 1893 and now I should judge that the Riverside canal No. 1 is about the same size as No. 2, but the grades are somewhat less. It has a wooden crib dam filled up with rock and a headgate at the head of the ditch. It did not have any measuring weir and does not have. Both of these ditches are practically the same now as they were in 1893. They have been somewhat neglected. The Riverside No. 2, its south branch, combined in Sec. 25 with Riverside No. 1. The north branch of Riverside No. 2 combined with Riverside No. 1 in Sec. 19. In 1893 the King ditch was practically the same proportion as the Riverside ditches, about 8 feet on the bottom. They were all three about the same. About  $2\frac{1}{2}$  feet of water in depth. If there was any water in the river, they generally got enough without any dam.

393 The Caldwell and Gardiner ditch is about 6 feet on the bottom and has a headgate and a dam at the head. The dam is of pilings and logs crosswise against the piles and rocks against that. It was that way in 189—. Neither the King ditch nor the Caldwell and Gardiner ditch has any weirs.

These are the ditches that used to irrigate land of the Riverside company. We required such large ditches because there was considerable land to cover. In places we had to have large heads of water to properly flood our hay land. We could irrigate with a small head after we had irrigated a couple of weeks or so. The first irrigation usually occurred during the period of high water. We generally kept the ditches full. I had a gauge in the river and so when the water raised or lowered I regulated the headgate accordingly.

The water officials of Wyoming did not regulate our ditches  
 394 at any time, they have lately.

In the '90s quite a number of ditches diverted water from the river above the ranch. The ditches upstream from the Riverside ranch are the Fischer ditch and that of Mr. Oscar Sodergreen. The next is the Park. The next belongs to Popp and Pahlow. The Last Chance ditch is the Burgland ditch. The next above the Popp and Pahlow ditch is the Pioneer canal. Next above that, in 1893, was the Lund ditch and then there is the Gus Burg ditch. The next above the Burg is the Porter ditch. Next above that the Jim Polack, called the Charles Heidrick ditch. The next is Frank Smith's. That is all the ditches I know of to the  
 395 Colorado line. The Burg ditch takes its water at Woods Landing. The Porter, Heidrick and Smith ditches are all above Woods Landing. All of them except the Burg are ditches irrigating small acreages of meadow along the bank of the stream. The first ditch irrigates quite a lot of land. It heads at Woods Landing, and another ditch taken out of Fox creek empties into the Burg ditch further down. Fox creek is a tributary of the Big Laramie river. The Burg ditch takes its water from both the Laramie river and Fox creek. No other ditches that I have named take their water from Fox creek.

Since 1893 the Sodergreen ditch built by Oscar Sodergreen has been constructed, taking water from the Laramie river. It  
 396 heads below Fox Creek. There is the old Sodergreen ditch, between that and Riverside No. 2. This last Sodergreen ditch is the Sodergreen High Line. I believe the Pioneer canal was enlarged in 1910 and '11. I don't believe any water was carried through it into Lake Hattie until 1912. I don't know as it was finished in 1911. I didn't pay much attention to the Pioneer canal. I was not there when they were constructing the north end of the canal by washing out the ditch. I don't believe they were running water through the inlet to Lake Hattie except in flood times.

After the Denver-Laramie Realty Company had purchased the Riverside ranch they made a high line to the King ditch. None of that work was done by the Riverside company. It was  
 397 started for the purpose of carrying water through to Hutton lakes, natural lakes fed partly by Sand Creek and partly by Antelope creek. Creighton Lake also had water in it. There are three lakes there. Sand Creek runs into Hutton Lake. Sand Creek runs into Creighton Lake and Antelope creek into Hutton lake. There is not much water coming from Sand Creek into the big Laramie river. It generally runs into that lake. Very little of it comes into the Big Laramie. Sometimes in high water it might fill that lake and run out again. A large part of the year there is no water in Sand Creek. After the water has entered either Creigh-  
 398 ton or Hutton Lake it ceases to be of any value for irrigation. There is an intention of taking out ditches from these lakes but there has been no work done except putting the reservoir in. These two natural lakes were intended to be utilized as a part of the reservoir scheme started by the Denver-Laramie company in

connection with this King High Line ditch. They got the reservoir all built except the rip rapping. They have got the dykes built. They are large dykes. They have been finished. The outlets from the lakes have not been finished. The King High Line Ditch  
399 has never yet been used to carry water to these lakes.

Cross-examination by Mr. Fred Farrar:

In my testimony when I mention hay I mean native grass cut and cured for feed. These lands included within the Riverside ranch was not cultivated, except where we raised some oats and possibly some other grain.

399 Redirect examination by Mr. N. E. Corthell:

About all of Sec. 35, T. 14, R. 76 has been irrigated ever since I knew the place.

400 Also S.  $\frac{1}{2}$  Sec. 24. All the land between Riverside Canal No. 2 and the river is irrigated. All the land between Riverside No. 1 and the river except about 35 acres in Sec. 36 is irrigated.

401 Beginning in Sec. 2, T. 13, R. 76, King Ditch distributes water to the north and to the south.

The Caldwell Ditch is flumed across the Hogue and Haley Ditch.

No water taken into the Riverside ditches is wasted into the river except what little seepage there might be. It is all used up for irrigation.

402 Recross-examination by Mr. Delph E. Carpenter:

The Hogue and Haley headgate was originally on the north line of Sec. 28-14-75. In 1901 or '2 the owners extended the headgate up stream to a point in Sec. 29. At this time they cut through the Caldwell ditch and flumed the ditch across. A man by the name of Bush owned Sec. 12-14-75 in 1893. Irrigated by the Bush and Holliday ditch. Never purchased by the Riverside people.

403 OSCAR SODERGREEN, a witness in behalf of Complainant.

Direct examination by Mr. John D. Clark:

Have resided on the Laramie River about 23 miles southwest of Laramie City for about 35 years. Engaged in ranching and raising live stock. Live 8 or 10 miles due north from the Colorado line, and about half a mile above Riverside Ditch No. 2, and a mile and a half east from and below the headgate of Pioneer Canal.

404 For a number of years I was superintendent of Pioneer Canal. That canal is over 30 miles long. I think 3 years or so before I became superintendent the length of the canal was increased and its capacity enlarged. When I was superintendent Pioneer Canal was 16 feet wide on the bottom.

405 From the time I became superintendent until the Lake Hattie Project there was no change in the size of that ditch.

I was superintendent 10 or 12 years. I had no knowledge as to the acreage irrigated under the canal.

406 The farms under the canal are mostly from 160 to 320 acres. The farmers had cattle, chickens and pigs and farmed raising grain, hay, and vegetables of all kinds. Produce was raised for feed and for sale. I think farming predominated over hay raising. On the upper end of the river where I live we are more in the cattle business.

407 On my ranch I have irrigated a good many hundred acres and raise hay chiefly, for that business. I raise grain too nearly every year. I get about 30 bushels of oats per acre. Have never had a failure. Raise successful wheat crops.

408 Late frosts in spring and early frosts in the fall have not prevented success. Raise no corn except have raised sweet corn for 30 years. Never had a failure in that except last year. I live about 15 miles from the Colorado line if you follow the river 8 miles in a straight line. Between me and the state line are the ranches of N. K. Boswell, Frank Smith, Jim Pollack, Fred Hansen, Gus Berg, Jacob Lund and J. E. Johnson. I know the tributaries of the Laramie between me and the state line.

409 They are Johnson Creek, Beaver Creek and Fox Creek. Woods Creek don't amount to anything. Fox Creek don't amount to anything. One ditch takes all the water from it. There is a pretty good flow in Johnson and Beaver Creeks early, but before we begin to irrigate where I live the water is all gone out of Johnson and Beaver Creeks. We begin to irrigate about the first of May. I know the Murphy Ditch of A. M. Goode. It was constructed in 1877 or 1878.

410 It irrigates about 80 acres. I built the O. Sodergreen Ditch in 1878.

411 And extended it in 1884. Also have the Last Chance Ditch and the Fisher Ditch. From the three last named ditches I have irrigated 800 acres ever since 1884, taking the water from the Laramie. The O. N. Ditch of Mansfield takes water from the Laramie and was constructed in 1884 or 1885. It irrigates pretty near a section.

412 Con Hammond built the Hammond North and South Ditches about 1885-1886. It irrigates 160 acres, maybe more. Smith Ditches Nos. 1 and 2 are 8 or 9 miles above me. They were constructed in the '80's and irrigate 80 acres. Lund's North Line Ditch was constructed in the '80's and irrigates about half a section.

413 Burg's Ditch was constructed in the '80's and irrigates perhaps over 200 acres. My Central Ditch irrigates 50 acres.

414 Sodergreen Ditches 1 and 2 were constructed in the '80's and irrigate 300 or 400 acres. O. G. Ditch of H. Olson was built about 1887 and irrigates a section. Fisher Ditch was built in 1887.

415 I think he irrigates three or four sections from that. I irrigate 40 or 50 acres from Sodergreen South Ditch. It

was built in 1887. My brother's Island Ditch has been there ever since I can remember.

416 He irrigates 80 acres from that. Charles Heidrick's ditch is 7 miles up the Laramie from my place. It was built in the '80's and irrigates 160 acres.

Parker Ditch was constructed about 1896.

417 It irrigates 1,650 acres. The Last Chance Ditch was extended in the early '90's.

418 Popp & Pablow made the extension and irrigates from it about 1,120 acres. I built Sodergreen High Line Ditch about 1910 and irrigate from it 4,000 to 5,000 acres.

419 I raise hay and some grain and some potatoes on these lands. I begin to irrigate about May 1st, and shut down for native hay about the middle of July, and for alfalfa later. The water begins rising about May 1 and is highest about June 10th, and ordinarily gets low the latter part of July. This year there was a shortage caused by light snow fall in the mountains. All these ditches take water from the river by means of loose rock dams and head-gates.

420 Sometimes dams wash out and you must watch head-gates.

My High Line Ditch was surveyed in 1907. At that time there was plenty of water in the river and a good many "last chances" after that to get a ditch.

#### Cross-examination by Mr. Delph E. Carpenter:

420 The first creek that empties into the Laramie river starting near the inter-state line is Johnson creek. I do not know

421 whether or not that stream rises in Colorado. It flows north-easterly, joining the Laramie river about a mile below the inter-state line. The next tributary to that stream is Beaver creek, possibly some of it rises in Colorado. I think some of it rises in Wyoming. It joins the river about two miles below inter-state line. Bear Gulch joins the river at Jelm. Two or three little stubs of creeks come in through canon below Bear Gulch. Porter and Wood creeks enter the river below this. The latter has little water except in the spring. It generally dries up in June. The next tributary is Fox creek, with a considerable drainage area.

422 Generally dry about last of June. If — rains heavy Wood and Fox creeks flow. I have know- Fox creek to flow a great many times after July 1st. Don't know as to Woods creek. Late in the fall sometimes Woods Creek will start. Fox Creek starts whenever the rains and snow begin to come. Johnson and Beaver creek both flow during the fall and winter months. Outside these creeks I have named there are a number of stub creeks coming down from the mountains and emptying into the Laramie at times when the snow is melting in the mountains. They discharge water the latter part of April and May.

Jelm mountain is about one mile from my ranch. Sheep  
423 Mountain is about 3 or 4 miles. My buildings are on Sec. 32, Tp. 14 N., R. 76 W. The country tributary to the Laramie

mie above the points where the river runs between Sheep mountain and Jelm mountain is mountainous. It is so to the inter-state line, with the exception of the small river bottom. I am located at the upper extremity of the Laramie Plains. Immediately across my ranch the Laramie Plains end and the mountainous district begins.

Johnson and Beaver creeks are tributaries furnishing considerable water to the stream. The snows first begin to melt in the spring and the waters to flow. As the days become warmer the melting extends higher up the mountain sides. At the southwest portion of the

Laramie Plains the ice goes out always in the month of  
424 March, at our place, and the snow begins to melt about the first of April, and the drifts that are piled up during the winter around there. The drifts disappear along in May. The wind drifts the snow in my vicinity and pretty deep in the gulches. During this period these little creeks and unnamed tributaries are running. My ranch is about 7,350 feet in altitude. The grass on the meadows begins to grow in April. Growth very slow until in May. The days are warm but the nights are too cool for rapid growth. The grass increases until June. It is growing then about as fast as any time I guess. It ceases its growth about the middle of July. That is the time I stated we dry up our meadows preparatory to harvesting hay. I generally aim to begin cutting hay July 25th.

We aim to finish in 30 days.

425 Our harvest continues for a period of about 30 days after July 25th. The same custom exists up and down the valley. When I speak of hay I usually refer to native hay.

I do not know when the frosts cease. We figure that we are safe to plant our garden by the middle of May. By the time the garden is up, after planting in the middle of May we will be comparatively safe from frost. During some years the frosts have occurred at my place every month. We haven't had frost this year but down near Laramie I understand they had a little, in July. My place is a little

closer to the mountains. In September we sometimes have  
426 a little frost. In October a white frost. The years vary in this. I have seen snows at my place September 13th and then again not until November, they vary. I saw one snow storm in my vicinity July 4. It rained in the valley but snowed on the mountains. It snowed in the mountains about 2,000 feet above where my land was. I have known snows to cover portions of the Laramie Plains in June. These snow storms have occurred on the Plains more frequently in the month of May than they have in June. In

the Laramie Plains the thermometer varies quite suddenly in  
427 the summer. The Laramie Plains is quite noted for its winds in the early part of the summer and the latter part of the spring. I don't know whether more windy than other portions of the country. Where I live the prevailing wind is from the southwest. I think it is much the same further east. It is windy in the summer and fall. The wind is so frequent during the winter that practically all the snow that falls drifts. As a rule it blows nearly every day during the winter.



428 The corn I plant in my garden on May 15th comes up in about two weeks. We aim to avoid the frosts in the last of May. The frost has nipped my garden and corn a little sometimes.

I raised oats a number of years on my land. They ripen for harvest about this time. I am running a binder today, August 29th. This would hardly be our ordinary harvest time. On an average about the 10th of September would be our harvest of oats. The present season is a little earlier than the average. Maybe I got my grain planted earlier than some of the others. I planted my oats

429 in April. We usually try to plant April. Under average conditions we irrigate our oats three times while they are growing. I am raising white Swedish oats this year, and I have raised the black Russian. This year I have between 30 and 40 acres of oats. In previous years I have averaged from 10 to 60 acres. I always feed oats to my stock and one thing and another. I also entertain travelers at my ranch.

I have raised some barley. I had about 4 or 5 acres of  
430 barley two years ago. It is called Bald barley: It ripened earlier than oats. We generally have barley cut long before we cut oats. I did not have a good yield in 1911. I got too much water on it and it didn't yield as good as previously. If you give it too much water it dies out. Two irrigations is all that I have ever given barley. I raise barley and use it for chicken feed. That is not the same variety of barley usually raised on the Laramie  
431 Plains. They raise the other kind too. The other yields a larger crop than the Bald barley.

I have not grown wheat very extensively. We have been in the custom of harvesting our wheat about the 10th of September. Just about the same time as the oats. I might have threshed my wheat some years, but mostly I stack it for chicken feed. We irrigate wheat about the same as oats. I could not give my average production of wheat. We generally plant as early as possible in April. The growing period for both our wheat and oats extended over about the same period of time. That would be from April until September  
432 10, as a rule.

We aim to raise the early Rose or Early Ohio. You must wait until a certain date before you can irrigate wheat. If it is a growing season and plenty of rain in the spring, it grows faster and your dates are different. We irrigated last when it begins to head, that is in latter part of July. We irrigated oats the last time about the same date. We plant potatoes about the middle of May. We aim to harvest just before the frost gets them. They are ready from August 29th until September first. I usually cultivate only  
433 enough potatoes for my own use. Have never kept track of the production. I cannot say what my heaviest crop is. That is not a country for the cultivation of potatoes for market. We are too far from the market. I just raise enough grain for my own use on the ranch and vegetables. I raise sweet corn for roasting ears, planting about the middle of May and it is ready for the table about September first.

Other than the crops mentioned, I use my land for native hay.

We have about 40 acres of alfalfa. One year with another we cut two crops. We harvest our first cutting about July 5th. It is  
 434 then about in full blossom. It is then in the best condition for hay. I obtain as a whole about a ton to the acre for the first cutting. We harvest our second cutting between first and 15th of September. I obtained about a ton to the acre last year for the second cutting, I don't know what I will get this year. Last year was a little above normal for my second cutting. I have been raising alfalfa in this one patch for 15 years. During that period of time my average production for that patch per second cutting would be about a ton per acre. The figures I have given are approximate. I only give alfalfa one irrigation after the first cutting. That is on account of this particular land gets seepage from other irrigation. I give the alfalfa this irrigation right after the first cutting. I do not think I have ever failed to get a second cutting on account of the frost. I don't know that frost has ever hurt my second cutting any, it has been touched once or twice but never destroyed. A frost about August 25, 1910, hurt my second crop but didn't destroy it. Quite frequently the frosts hurt my second crop, but do not destroy it.

The major portion of the land I irrigate I use for hay and pasturage. I do not know what you would term the native hay, it is called native hay. There are several varieties of grass. I would obtain about half a ton to the acre of native hay from the land which I cut. The choicest spots on my ranch will possibly grow a ton and a half to the acre. On those spots it will grow heavier than the first cutting of alfalfa. We figure if it does not average half a  
 436 ton to the acre we let it go for stock to graze.

I own the northwest quarter of Sec. 32, Tp. 14, N., R. 76 W. I own sections 28 and 29, same township. That is the old homestead. The other lands are on the table under Sheep Mountain. There are about 320 acres of 29 that you might call meadow land which I use for pasture. It is under the Sodergreen ditch and the Jones and Norton ditch. A good portion of the north half of that section is above water. I am including practically all of the south half of Sec. 29 as land of the character I have described. Some of the north half comes under the Sodergreen High Line. I would guess that about 200 acres of Sec. 29, the south half, are used for meadow, the remainder supports my work horses and my milk cows and stuff I keep around the ranch in the summer. I generally keep in there about 15 head of cattle and 40 head of horses, during the  
 437 summer. This portion of Sec. 29 is all I have for pasture. These stock obtain their entire feed there. I do not feed my cattle hay in the summer. These cattle graze this land during May, June and July, and about August 1st I turn them back on the meadows where I have been cutting hay. I also have my garden and buildings on south half of 29. I irrigate about one-half of the northwest quarter of Sec. 32. The south, Central and Sodergreen ditches cut that. The Central ditch has its headgate across the river from the Sodergreen ditch and uses the same dam. It irrigates a sort of an island. The island goes from the north-east to the southeast end of this quarter. This Central ditch irri-

- gates that island. The South ditch irrigates the land between the bluff and the old channel. The headgate of that ditch is about a quarter of a mile above the other dam and below that of the Popp and Pahlow ditch. South ditch is about half a mile long. The land irrigated by the South canal is used for native hay and is about 60 acres. About 50 acres on the Island are irrigated by the Central ditch. I irrigate Sec. 28 except the north four forties which are on the edge of the high table lands. My alfalfa is towards southeast corner of that section. These lands are all that I irrigate of my home ranch. It is irrigated from 3 or 4 ditches. At the same time my new Sodergreen High Line ditch covers it all. I do not irrigate from the Parker ditch. I use the Sodergreen, Fischer and Jones and Norton ditches. The Jones and Norton ditch is sometimes known as the Popp and Pahlow and also as the Last Chance. It is on record as the Last Chance. It was located as the Jones and Norton ditch and then built down as far as my place. Years afterwards it was completed and called the Last Chance ditch. They speak of it generally as the Popp and Pahlow ditch, because those are the men who own it. I irrigated from that ditch. I have a 250 acre interest in it. I have sufficient interest in the Fisher ditch for the irrigation of about 100 acres.
- 438 The Sodergreen ditch belongs to me. These are the three ditches from which I obtain water for this land. I cut about 400 tons of native hay on my home place and these lands, being parts of sections 28 and 29 and the northwest quarter of Sec. 32, on an average year. I have about 800 acres in that field that I irrigate.
- 440
- 400

I stated that Frank Smith irrigated some land on their gulch or in that vicinity. He only irrigated about 90 acres. It lies along the margin of the stream. The only irrigation between his place and the state line is on the Boswell ranch. Some of the ditches that irrigate that ranch are taken out in Colorado. The Bliler and Boswell ditch is taken out in Colorado. They may have other ditches that I don't know anything about. Some are taken out in Wyoming. I do not know whether Boswell has any ditches out of Johnson creek. A fellow living on Johnson creek named Ovid has some ditches out of Johnson creek. A ditch takes water from the Laramie at mouth of Beaver, belonging to Boswell and irrigating a small tract at the mouth of the cañon. From there the river runs through a narrow cañon to the Frank Smith property, near Jelm. Jim Pollack is located next down the river from Frank Smith. He is between Smiths and Woods Landing, in the Jelm bottom. He irrigates small patches along the river. I don't think he has over a quarter of a section. The next man down the river is Hanson. He irrigates about 80 acres, close to the stream. Both Pollack and Hanson properties are on the floor of the cañon, the mountains below the Hanson place close in forming a narrow cañon down to Woods Landing. The latter is near the east line of Sec. 10, Tp. 13 N., R. 77 W. At that point the Burg ditch, owned by Gus Burg's estate, takes water from the

river. This ditch is about 4 miles long and irrigates about 200 acres on the river bottom, but he extended his ditch out on Sheep mountain flats and I don't know how much he irrigates  
443 with it. He also owns the Fox creek ditch. That also goes to Sheep mountain flats. It is taken out of Fox creek at a higher elevation than the Burg ditch. The 200 acres irrigated along the river bottom run along edge of stream. The next ditch below the Burg is the Jacob Lund ditch. He has a small ditch  
444 on each side of the river taken out from the same dam. He irrigated about 300 acres. The land on the south side was originally upland, but he made it into hay land. The north or west side was old natural river bottom. It was used for hay always. He raises hay with both ditches. He owns Murphy ditch. It comes out just below his meadow that his two ditches cover. This ditch is about half a mile long and irrigates about 80 acres. The land lying between the ditch and river. The next canal is the  
445 Pioneer canal. My Sodergreen High Line starts there too, just above the Pioneer. This is the third year I have been irrigating land by my high line canal. I commenced the survey of this ditch in November, 1907. I began the actual work of construction in February or March succeeding the survey. The canal is about 9 miles long and was taken out for irrigation. I have irrigated from that ditch since I began. I ran water through the irrigating seasons of 1911 and 1912. In 1912 I ran water until it began to freeze. The same in 1911. The ditch was never  
446 full of water. Towards the last the water got low in the river. I have been running water through the year 1913. I stopped running water July 1. I own sections 5, 7, the west half of 8, 17, 18, 19, the north half of 20, and the southwest quarter of 20, Tp. 14, R. 76; also the north half of 30 in the same township and range, the north half of 24, Tp. 14, R. 77. All but 40 acres in Sec. 13, but the ditch covers only about 100 acres in 13. The canal was taken out to irrigate the lands described. I don't know how much has been irrigated, all that I could. These lands lie in  
447 a regular natural slope, and it irrigates by just turning the water out of the ditch at intervals. It was raw prairie land. The greatest part is hay land now. I cut about 50 tons of hay last year, but this year it came in fox tail hay and I didn't cut it. I left it standing for feed. About 100 acres is cultivated. 50 acres in Sec. 30, 40 acres in Sec. 20, and 10 acres in Sec. 24. The 50 acres on Sec. 30 was in oats. It has not been planted this year, it was in 1911. During the last two years I have used it for  
448 pasture. It will best be adapted for that purpose until I irrigate it long enough, until it will produce native hay, which comes some little later. It takes from 3 to 5 years of continuous irrigation to get this 50 acres on Sec. 30 to native hay. The 40 acres on Sec. 20 which I had plowed, were planted in oats 3 years ago and also in 1912 and '13. The oat patch on Sec. 20 is now growing a pretty fair crop. I had a pretty fair crop in 1911. It went about 30 bushels. I didn't get quite as good a crop in 1912 as I did the first year. I am going to put that field in alfalfa next

year. Of the 10 acres on Sec. 24, I had some oats and potatoes. It is not in crop this year, except a small piece of potatoes. I am converting the rest of it into hay land.

The chief value of this land is for native hay. The soil is quite thin and that beneath this top soil is quite a pronounced strata of very coarse gravel and fine sand. It has been my practice to run water out of this ditch constantly so as to raise the water plane in the gravel, that is our system with that kind of land. I do not know how much more water it takes to irrigate land that way than it would with the ordinary flooding or running of water in furrows.

I simply turn the water out of the ditches up near the main  
450 canal and along the foot of Sheep Mountain and it runs down to this gravel. By this method it raises the water plane

so as to eventually wet the grass roots. I don't know how thick the strata of gravel is there. They cut through it cutting through the supply canal for the Pioneer Canal Company, the Lake Hattie Water Company, they cut through it in places. I should think that this Lake Hattie inlet will serve to drain off the water from my land and thereby lower the water plane. My land is above and below the Lake Hattie inlet. My High Line canal crosses the inlet to Lake Hattie. I cannot give the acreage irrigated from this canal in the three years that I have been operating it. I have irrigated about 100 acres in Sec. 30, Sec. 19, a little over half of 20, 160 acres in 24, Tp. 14, R. 76. Perhaps 100 acres in 13, Tp. 14, R. 77. Nearly all of 18. I have considerable seepage from that ditch of the Pioneer canal company in sections 5 and 7. I ran water in there too, but it was hard to tell how much my water would irrigate. There must be half of seven and nearly all of 5 that is irrigated by these two ways and I don't know how to divide it. I do not know how much I irrigated on Sec. 17. I just turned water out at different times and didn't pay much attention to that, because it had a good deal of seepage from this ditch, and I didn't dare to give it much. After the season closed last year I irrigated considerably there after the regular irrigation season closed. I irrigated late to help fill up this land below. I do not know of any other ditch owners using this same method. I do not think the owners of land to the east and north of mine and principally under the Pioneer canal toward Laramie city have had to irrigate in the same manner. I think their sub-soil is not so deep. They generally run water right over the top of their land in furrows and ditches.

452 I would obtain no results if I irrigated my land in the same way they do theirs. The water would all disappear. We have to irrigate this particular land of which I am speaking so as to fill this land full of water first. If you do fill it up until the water comes to the surface, then it takes but little water, and it irrigates easier after that, but it takes a tremendous amount of water to fill this ground full from the bed rock up. There is not much of any alkali appearing so far as I see. The alkali has appeared in only one small spot. If alkali is going to appear it should have come up by this time. I dare say that you can dig down into this land now and find water within two feet of the surface, and maybe



within a foot. The ground is damp now and has not had any water on it since the first of July, but whether it will be that way in the spring I could not say. I do not know that there was  
453 any objection made to my use of the canal in 1911, '12 and '13 by other ditch owners. The Pioneer Canal Company shut me off about July 1 this year.

That is the first time when the water officials interfered with the appropriators.

The irrigation of these lands has been materially aided by seepage from the Lake Hattie Inlet canal. I do not have any way of knowing how much water it will take to irrigate this land after I have the water plane filled to near the surface. It has taken considerable

water to fill it. It looks like it was pretty well filled now. It  
454 don't take near so much to get it started this year as it did the year before. I never made any examination of the land

east of mine to ascertain how far east that formation of thin soil underlaid with heavy gravel extends. The only thing I can go by is where they excavated those ditches. Through Sec. 21 and part of Sec. 16 where the old Pioneer canal cuts through, *there* seems to be shallow in spots there and they cut through into the shale in making that ditch. They cut into what we call yellow shale. I don't think this same top soil underlain with gravelly sub-soil extends a number of miles from my place towards Laramie and beyond what is known as the Nelson Road House. It is a different character of soil from

what my land is. The gravel stops before we approach the  
455 Seven Mile Lake. I do not think it goes much east of the

Popp Lane. The soil throughout the entire Laramie Plains region contains a considerable amount of gravel. There is a difference in this gravel. In some places there is coarser gravel than others, and there is more of it in some places than in others. Up at the foot of Sheep Mountain, where my land is, most of the gravel is egg shape, and then it runs up to boulders as large as that (indicating), about half as large as a man's head on the surface. Where I cut my ditch through the hill over into the flats we found boulders as deep down as ten feet. The soil at the surface was about two and a half feet thick. When I was speaking of this area not ex-

456 tending so far easterly, I meant the area having this very large gravel. There is not nearly as much of it and not the same kind of gravel as there is up on the Sheep mountain flats. I have seen the ditch break out and water stand and flood there for acres and have to fix the ditch and leave the water stand there, and it would stand there for a week, and for that reason I know there is no gravel underneath. In my country where I irrigate it won't stand fifteen minutes. Down there it will stand for weeks. In the vicinity of the Grable place, there are some alkali lakes standing with water in them the year round. I don't call that gravelly land. There is gravel showing in the plowed fields. You would see gravel right on the surface. The gravel has enough soil mixed with it to make it tight.

The next canal down stream from the Murphy ditch is the Pio-



neer canal, the largest canal taking water from the Laramie river in the Laramie Plains region. It was commenced along in 1879. It was enlarged during the eighties. I was superintendent of that canal for a number of years. I started in May, 1887 or '8, and had charge for ten years or more. My duties were to keep a continual flow of water in the ditch and look after it in a general way. I would open the headgates for the consumers. In 1879, when they built the canal, it was about 30 miles long. It went a little northwest of Laramie. The enlargement went to the same place. I only delivered water to the consumers at their lateral headgates. I could not describe the lands irrigated. I could not say which lateral received the most water from the Pioneer canal during the years I had control. Most of the lateral headgates were located down below Laramie from what we call West Laramie, the most of them were down. I never had charge of that. I always turned that over to another man. I turned the water over to him at the Preigle ranch. It was in vicinity of Seven Mile Lakes in Sec. 16, Tp. 15 N., R. 74 West. There were a good many users of water between the headgate and the Seven Mile Lake. Starting at the upper end of the canal they used a little water at the Johnson ranch, close to the headgates, on the river bottom. The next place was near Sodergreen Lake, a ditch comes out there and irrigates some land. It crosses Last Chance and Parker ditches and irrigates some ranches on that bench. It irrigated the Tommy Hefron ranch. Mr. Matson has that ranch now. Bloom also irrigated under that lateral. A Russian, Harvenneck, lives there now. The Stromberg place was also irrigated. The Bloom place was east of the Popp Lane. The Stromberg place was south and east from the Bloom place. I think those were the lands irrigated from that lateral. The next place down the canal is Sec. 16, Tp. 14, R. 76. Chris Gabrielson irrigated from that lateral. He lives on Sec. 10. He has been there 10 or 15 years. He used that lateral entirely. The next lateral starts right close and runs due north and irrigates close over to the next township half section. Pretty nearly east of Lake Hattie. Two homesteads of 160 acres each irrigated from that lateral. That was built 10 or 15 years ago. I do not know how much of their land they irrigated. The next lateral was one for the irrigation of part of Sec. 11. All land in Sec. 11 lying north and west of the Pioneer canal was irrigated by Nate Johnson. I put a box in there when I had charge of the canal. The next lateral was in Sec. 1, Tp. 14, R. 76 and used for the irrigation of Sec. 1. A portion of Sec. 1 does not require irrigation owing to seepage and a portion of it is high grazing land above the canal. The next lateral was on Sec. 6, there was the Vass and the Roberts ranch that irrigated from that lateral. The location of the original Pioneer canal was abandoned on Sec. 6 and the line was run across Sec. 6 and into Sections 31, 32 and 33 in the township above. Benson lives now on the Roberts ranch and Mr. Vass still lives there. The next lateral was for Sec. 32. There were four settlers on that section.

I do not know how much land they irrigated. The next  
464 lateral was at the Osterman ranch in Sec. 28, Tp. 15, R. 75.  
The next lateral was at the Joe Wheat Ranch. He used to  
465 irrigate about a half a section below the ditch. Possibly Sec.  
26. Those are laterals out of which I distributed water.

The settlers secured water during my administration by paying  
the company fifty cents an acre per year. The Wyoming Central  
Land and Improvement Company, or may be it was the  
466 Pioneer Canal Company, they were the same company. I  
delivered the consumers practically all water they wanted.  
We had plenty of water for all.

I do not think that any of lakes which appear on the map below  
the Pioneer canal are used for the storage of water for irrigation.  
The water is always there. Whatever gets out has to evaporate.  
Practically all of them have always had water in them. I suppose  
they obtained the water from rains. They were natural basins.  
Since the irrigation in that country they have filled naturally. None  
of them are used for irrigation. We began running water in  
467 the Pioneer canal about April 15, and kept it running  
throughout the season. When I was superintendent the most  
water was used at lower end of the Pioneer.

This land under the Pioneer was settled in 1887 as now, only  
more of them now. Shortly after 1887 during the early nineties a  
number of families sold out to their neighbors. A good many of  
the holdings under the Pioneer are larger now than in earlier days.  
They have not so much bought out their neighbors as they have  
purchased railroad lands. I cannot give you the land under the  
Pioneer canal that was meadow. A man that had 160 acres if he  
could irrigate it, he would farm all he could of it and the rest he  
would irrigate for native hay. Wheat and oats were culti-  
468 vated under the canal generally for market. I understand  
the Millbrook project owns a mill in Laramie and a 5,000  
acre ranch. They haul their grain to the mill. The Millbrook  
ranch, on the north side of the Little Laramie, is part of  
469 the Bell ranch and distant 4 or 5 miles from the Hahns  
Peak railroad. I think the mill is in operation now in  
Laramie. At one time Augsperger ran it. I cannot approximate the  
years the mill remained idle. There is land under the canal be-  
tween the head of the canal and the Seven Mile Lakes that is un-  
broken prairie. A man cultivating native hay don't break his land,  
just irrigates it. The greater portion if the land between the ditch  
and Seven Mile lakes is cultivated. Some pieces are used for pasture.

It has gone into the hands of private owners. I include as  
470 cultivated that irrigated to native hay as well as that actually  
tilled. I have not gone over this land to determine how much  
is irrigated, I am judging from general observation, from a distance.  
I understand that Mr. F. C. Grable and Mr. J. S. Grable did buy a  
ranch or two. I guess they have sold some of it, but they haven't  
cut it up much. They may have sold some of it, but the settlers are  
not there. The Grable ranch receives its water from the Fischer  
ditch. The Fisher ranch didn't receive any water from the Pioneer.

These meadow lands were irrigated in the same manner as the meadow lands on the bottom.

471 Cross-examination by Mr. Fred Farrar:

I do not know how many acres were irrigated under the Pioneer canal when I became superintendent or how many are now. I cannot give you the population upon the various ranches irrigated from the Pioneer canal in 1886 or now. The canal was constructed before I took charge as superintendent. I was on the ground and helped to make the canal. I think they turned water in the enlargement in 1885. The first ditch that was constructed was built in 1879, I think. The original ditch was as long as the present ditch. They have a waste ditch at the lower end, in case of a rain or flood up the ditch they could turn it out. The original ditch, before enlargement, was just a small ditch, 5 or 6 feet wide on bottom. I don't

472 remember how much water it originally carried or know its present capacity. General farm crops were irrigated under this canal in 1886. They had not then begun raising native hay but they raised oats and grain and vegetables the same as now. I have not been down at lower end of canal in years and cannot state how far beyond a point directly west of Laramie it runs. It may run approximately 10 miles and it may have been extended. I don't know.

The Laramie, Hahns Peak and Pacific railroad runs nearly west from Laramie. It does not follow the Laramie canal. My nearest railroad station is Laramie, 23 miles by wagon road. Laramie is the nearest railroad station on Union Pacific to all ranches on this canal up the river from Laramie. The Laramie, Hahns Peak and Pacific Railroad was built a few years ago. Laramie still the most practical point for people under that canal. Any wheat raised under the canal for sale at Laramie would be hauled from the ranches to the city by wagon. I don't think they raised very much wheat under the canal in 1886. They never have raised any great sight. They raised more oats than anything else. The oats were raised

473 for commercial purposes and for feed on ranch. Hay cut on land under this canal compares in quantity about the same with the hay on bottom land. About the same variety of grasses. It is composed of wire grass and blue stem. Hay raised on ranches under canal was fed to stock of settlers and some of it came to town to supply livery barns and dairies. Hay on ranches not adjacent to Laramie was fed to stock. Nearly all ranchmen under this canal had a small dairy, raised a few horses, and made butter. I do not know that I have had any litigation with the Pioneer canal people. I am proving up my ditches. We always settled our difficulties without going into court, unless it was some years ago. Maybe there is something pending that I don't know anything about. When we want to prove up our ditches, everybody up and down the river filed a protest against the way the Pioneer people were trying to prove up their water rights and also the Wyoming Development Company. I was a party to the litigation. I do not remember

475 whether or not I testified. I could not say whether or not fewer people actually live under this canal today than a

number of years ago. I don't travel along that ditch, and there are lots of people along that ditch that I don't know. I do not know that ranches formerly owned by various persons have been consolidated, except the instance near the stockyards, purchased to have a ranch for cattle shipped in transit. It is possible that Talmadge and Buntin bought a few ranches and consolidated, but there are people living in all those houses. Whether they own or rent them I do not know.

I did not have a measuring weir at headgate of Pioneer canal when I was superintendent. Water was never measured out to me by state officials. I was allowed to take all I wanted without interference. This canal is not further than 4 or 5 miles from  
476 river at any place. The line of canal is parallel with river for its full length. The general slope of country is toward river. Sometimes there is a little basin and it slopes toward the basin. The inlet to Lake Hattie reservoir leads out of Pioneer canal. The canal was enlarged from headgate to this point. I do not remember when the work was done, but they started at Sodergreen Lake. They then started two machines—one went down toward Lake Hattie, and the other went up Pioneer ditch, followed its old line except where they left a lake. They cut across land of mine until they struck the old ditch then followed it up. That work was done somewhere in 1911, by contractors. I believe the company was  
477 the Laramie Water Company. This intake from Pioneer canal to Lake Hattie was excavated, but not to its full size all the way. They used the steam shovel, or drag line, to a point within a mile of Lake Hattie where they quit work with this machine and made a very small ditch with teams, plows and scrapers; and then turned the water in and let it sluice it out. The water through this portion cut a channel into the reservoir, which channel is now 25 or 30 feet deep in places and 25 or 30 feet wide. A little water was turned into the reservoir in 1911. Water ran into the lake during 1912 during the high water season, for about two months. The same is just about true of 1913, maybe not quite so long. I haven't seen the reservoir in 1913. I saw it in 1912. It was not filled. Water was carried over in the reservoir from 1912. No water was used out of it in 1912 for irrigation or any other purpose. During 1913 I have seen water in the ditches below here, but I haven't been to reservoir. I don't know how much water was held over at the end of 1912. The water in the reservoir finds its way back in part into

Pioneer canal. I never did work for Mr. E. D. Titus.

479 I think the Laramie Water Company built Lake Hattie. Mr. Goldsborough is the head man in here doing the construction work. What position he holds I don't know. I met some of the other officers but I don't remember but one man's name, McDonald. He traded with me for right of way through my ranch for ditch. I was familiar with the companies out of which the Laramie Water Company was formed. The Laramie Water Company absorbed the Wyoming Central Land and Improvement Company. They were local men and lived in Laramie, pretty near all. It was an old company. I do not know of recent companies out of which

the Laramie Water Company was organized. The Laramie  
480 Water Company absorbed the Pioneer company. I met Mr.  
F. C. Grable. He was operating in this valley. I do not re-  
call the name of this company. I knew Colonel Bell. I think he  
and Mr. Grable were associated in one or two projects. The Laramie  
Water Company bought up the Pioneer ditch with its appropriations.  
I suppose these appropriations are now used to a certain extent in  
Lake Hattie. There is an enlarged system of ditches from Lake Hat-  
tie. I do not know capacity of Lake Hattie. It is a big body of  
water. If the water was not stored in Lake Hattie it would go down  
to Wheatland reservoir, the next reservoir. I do not know  
481 whether or not the owners intend to put water in Lake Hattie  
during the winter months. They ran a little water last winter  
and it began seeping out onto my land under that ditch and I made  
them shut it down because it would freeze on top my land and  
spoil my pasture. They didn't run much last winter. I don't think  
they ran any water in winter of 1912. I required them to shut the  
water out of this ditch because it seeped through banks and went  
on my meadow and the cold water made it overflow and freeze on  
top of the grass, for winter feed.

They do not customarily use water in the river, only for stock  
watering. For domestic purposes only. No water is used in our  
valley for irrigation during winter. It never has during my resi-  
dence in this district. Water is stored in Lake Hattie from Big  
Laramie river and some from Little Laramie river.

482 Cross-examination by Mr. Delph E. Carpenter:

Sodergreen Lake is located on Pioneer ditch, on Sec. 28 and 21,  
Tp. 14, R. 76. The water is run into the reservoir from river and  
then drawn out through the Pioneer canal, they have bifurcation  
works there. When the Lake Hattie people obtained control of  
Pioneer canal, they enlarged Pioneer canal from Sodergreen Lake  
up to the river. The inlet to Lake Hattie leaves the Pioneer canal  
at Sodergreen Lake. At the bifurcation works, one line of the ditch  
goes to Lake Hattie and the other is utilized as the old Pioneer canal.

Lake Hattie inlet runs northwesterly from the lake. The old  
483 Pioneer canal runs northeasterly. The Sodergreen lake is  
still used as a regulation basin up to present time.

The old Pioneer canal was 16 feet on the bottom. The new  
ditch is 40 feet on the bottom from Sodergreen Lake to river, and  
is capable of carrying considerable more water in depth than was  
the one one. When I speak of a 16 foot bottom on the old canal  
I mean as enlarged in the eighties. Prior to the eighties it was  
smaller than a 16 foot bottom. I have never been to Little Laramie  
river to observe the inlet canal for diverting water from Little

Laramie river to Lake Hattie except where it crosses the  
484 road. The inlet from Little Laramie river is of good size.

They have run some water through there. This inlet is  
about 14 or 16 feet wide. If the Lake Hattie people did not divert  
the waters of Little Laramie river by this canal, and discharge

them into Lake Hattie they would empty into the Big Laramie river and go into Wheatland reservoir, both winter and summer.

The Lake Hattie people are constructing a ditch diverting water from Douglas creek across the divide and over into Little Laramie. Douglas creek is west from the headwaters of Little Laramie. It is a tributary of North Platte. When this ditch is completed it will bring the waters of Douglas creek over the intervening divide and discharge them into Little Laramie river. That water will then be diverted into Lake Hattie through the inlet ditch from Little Laramie river to the reservoir.

485 Cross-examination by Mr. Fred Farrar:

The headgate of the old Sodergreen ditch was built in 1878. I used the ditch that year for garden and a little of hay land. The ditch I had constructed in 1878 was about a quarter mile long. It was afterwards enlarged and changed too, but it was started from the river at the same place. That was in the spring of 1884. It is two miles long now.

I cannot estimate the amount of water stored in Lake Hattie during 1913. There is water there now. Water has been withdrawn from the reservoir. They turn some of it into the old Pioneer canal and are using it for irrigation. I do not know whether or not they are using all they turn out, or what they do with it. They were to do that to help those Wheatland people out. They were short of water. It was their plan this fall to draw water out of Lake Hattie and drop it into the river, to allow it to be intercepted by Wheatland reservoir, because of the scarcity of water at Wheatland. The Lake Hattie people stored more water than they needed this year.

486 The ditches which I have mentioned with the exception of Pioneer canal and Sodergreen High Line, are all relatively small. They are built on bottom lands along the river. Riverside No. 2 is a pretty large ditch. No ditches taking water in vicinity of my place divert water any great distance from the stream except Parker ditch and Last Chance ditch. They are taking a little further away.

487 Even with the Pioneer canal the greatest width of land between it and the stream does not exceed 4 to 5 miles. The others are all less. In some instances not more than 200 yards. I had occasion to observe the effect on the river, when water is taken out in these ditches and used on the bottom land close to the river. You can see seepage most all along the river down to the Riverside, coming back into the river in the wintertime because the ice don't freeze along the banks of the river and we call it seepage. It don't seem to raise the water in the river, but there is a little seepage there all the time. The river being the natural drainage of the country, it would naturally all drain toward the river.

I have noticed the character of soil on the bottom land along the river. The bottom of the river is gravel and sand. Close to the river most of that land is black loam mixed with sand and gravel.



Where the water overflows, it has deposited a sediment in this gravel and formed a soil that looks like black loam mixed with sand and gravel. It is a porous soil. Under this black soil is gravel. There is a gravel sub-soil throughout the bottom next the river. The first bench is the next bench above the old original river bottom bench land. It is very nearly uniform up and down the river and is 3, 4, 5, or 6 feet above the river bottom. It is sand and gravel mixed with soil on top. The soil, both on the present river bottom and on this first bench is obviously sand and gravel made by the river wash. The depth of soil on top of sand and gravel varies. It averages two or three feet. There are places where there is no soil above the sand and gravel. It requires less water to irrigate the river bottom than the first bench land as the irrigation progresses. A certain quantity of water will today irrigate more land in the irrigated section than it would formerly. Under the Pioneer canal there are meadows which are now irrigated entirely by seepage. There is one little strip under this canal that has always had seepage. It starts on Sec. 16, Tp. 14, R. 75 and continues through 10 and into No. 1. There may be a little seepage below that. Some small lakes and ponds within the area irrigated by the Pioneer canal and other ditches receive water from seepage, but most of these lakes always did have water before the Pioneer was built. The water has been increased in many of them since the irrigation. I do not know that it has become necessary to drain any lands under these ditches. I saw water standing on the Grable land. I don't believe if the land was mine I would drain it. I don't think there was water enough to hurt the land. I wouldn't put so much water on it and don't think he would. The ditch broke and the water simply stood there. If he had used the land for native hay it would have been just what he wanted. If he had plowed and farmed it, it would be too much. It would kill his grain.

Cross-examination continued by Mr. Delph E. Carpenter:

I have an idea the water stands all the time less than 3 feet below the surface under land I have described as being seeped in Sec. 16 and Sections 10, 11 and 1. I have never examined it. There appears to be a strip across these sections, about a mile wide, where the water stands less than 6 feet below the surface. The grass grows without irrigation. I don't know how far that moist strip extends below the Popp lane. I have an idea that some land under Pioneer canal on Sections 33, 34 and 25 in Tp. 15, R. 75 is seeped. I have not been there for many years. I am familiar with Seven Mile Lakes. They lie along the road southwest of Laramie in Sections 21, 20 and 29, Tp. 15, R. 74. I pass them in going to and from Laramie. I guess there are stretches from there almost to Laramie City in which the water is very close to the surface. That land has all been irrigated from the ditch. It appears moist during the year. The water does not appear to be

almost at the surface outside the irrigation season; There  
 492 is a white deposit along there, alkali or soda. The people  
 call it soda. It is on a direct line from the soda lakes. Some  
 land on south side of road coming in from Seven Mile Lakes to  
 Laramie City appears to be affected with seepage. Whether it is  
 direct irrigation or seepage I don't know. Ditches are there cross-  
 ing the road and irrigating the land below. Under this Fischer  
 canal and in the vicinity of the place now owned by Mr. Grable  
 there is a stretch covering portions of Sections 16, 17, 9 and 10 in  
 Tp. 14, R. 75 where the water stands pretty close to the surface,  
 quite similar to that land northwest of Pioneer canal I first de-  
 scribed. My opinion for the water standing so near the surface near  
 the Fischer ditch is that it is only a short way to shale and it can't  
 seep through and get away. The water has poured in from irriga-  
 tion the past two years and the rains. The little lakes used to con-  
 tain water before there were any ditches there. One lake is now  
 dry and has been dry all summer. I haven't been over to the other  
 lake this summer.

493 Cross-examination continued.

By Mr. Fred Farrar:

Part of my land is river bottom or first bench land. My land  
 under my High Line ditch is higher. My ranch joins the River-  
 side on the east. My land compares about the same with the River-  
 side, on the same bottom. The methods of handling these ranches  
 are about the same as to irrigation, harvesting, etc. They are prac-  
 tically the same land, except that I am immediately above the  
 Riverside.

The Millbrook ranch is over on the other side of Little Laramie.  
 The land is sand and gravel. There is very much difference be-  
 tween that land and my land. It is bench land.

I am generally acquainted with the place owned by Mr. Corthell  
 west of Laramie City. I think the soil there is a little different  
 from on mine. I do not believe the Riverside land on the same  
 bottom is less valuable than mine generally. I do not know that  
 there is very much difference between my land under the High  
 Line and the Riverside place. When land can be irrigated it is  
 pretty nearly all the same value. I don't think there is very much  
 difference between my place and the Millbrook place. The Mill-  
 brook ranch, where cultivated, is in a greater state of cultivation  
 than anything I have, and maybe worth more at present. I don't

know that there is much difference in value between my  
 494 place and the Corthell place. Corthell's would be more valua-  
 ble per acre. It is nearer Laramie. Aside from that I don't  
 think there would be very much difference in value, eliminating  
 improvements. The same would be true of the Riverside ranch.  
 I don't know what is raised on the Millbrook farm. That was  
 formerly the Bell farm. I am not acquainted with the Haley ranch,

I have been across it. I don't know *how* owns it. I don't  
495 know the number of miles from Laramie, 10 or 15. In a  
northerly direction. I have always heard it is included within  
the Talmadge and Buntin project, but I do not know.

495 Redirect examination by Mr. John D. Clark:

When I came here in 1877 there were but 8 or 10 places between  
Laramie and my place, and there was very little irrigation. The  
bulk of the country was unfenced.

496 Now it is all settled and fenced. The settlements on the  
Laramie Plains are numerous. That came gradually. Two  
of my neighbors raise some apples but not extensively.

Recross-examination by Mr. Fred Farrar:

The other man raising apples was on my place, just where he  
planted the trees. Durant owns it now. I do not know how  
497 many trees Mr. Lunt has, maybe 50 or 75. There are 6 or 8  
trees on the Durant place. They are the regular apples. I  
think they are different varieties. They are a very good dark red  
apple. He had 4 or 5 barrels of them one time when he was picking  
them.

Recross-examination.

By Mr. Delph E. Carpenter:

I do not know whether there are more than 8 or 10 ranches oc-  
cupied on the river bottom between Laramie City and my ranch.  
It is 30 years since I went down that river bottom to Laramie. I  
judge there would be twice that many or more.

There are lots of people I don't know their names living in there  
now. To start at the river and go down as far as I can from my  
place, then comes Durant, Olsen, Benson, Riverside, Fischer, Mans-  
field, and there is a big bunch of people I don't know who they are.

(End of Transcript vol. 1, Complainant.)

FRED RICKARD, a witness in behalf of the Complainant.

Direct examination by Mr. N. E. Corthell:

499 I live on the Laramie, 14 miles southwest of Laramie on  
Sec. 12, T. 14, R. 75. Have lived there most of the time  
since 1898. I own the ranch, and the Bush and Holliday ditch.  
The ditch was in operation when I first went there—had been built  
some years before.

500 It irrigates 180 acres in Sec. 14, 90 to 100 acres in Sec. 13.  
80 acres in Sec. 6 in the next township east. I irrigate  
500 acres in Sec. 12.

501 Mr. Wymore irrigates 40 acres on Sec. 12. We grow hay  
principally, some grain.

502 We have stock—principally horses and cattle. Our water  
comes from the Laramie. I have been short of water several

years since I have been there. I did not have half enough this last season. The shortage was in the river. When there is lots of snow in the mountains we have plenty of water; but in some winters there is not much snow, then we are short of water. We were short of water in 1902, short in 1903, very short, this year we didn't have half enough. In other years we were a little short but it was not so bad. There have only been two years when we had plenty. In all the other years we were more or less short.

503 I also have an appropriation through the Hogue and Haley ditch and get some water through that, for 40 acres of my land.

FRED RICKARD.

504 Cross-examination by Mr. Delph E. Carpenter:

I own 160 acres in Sec. 14 and all Sec. 12 except 80 acres. That is all. Mr. Mason owns the west half of east half of Sec. 14. Mr. Wymore owns the southwest quarter. The Riverside ranch owns the remainder. It belonged to Caldwell and now the Denver-Laramie and Northwestern people own it. Sec. 13 belongs to the Caldwell field. That belongs to the Denver Laramie Realty Company. These lands are in Tp. 14, R. 75. I homestead 160 acres in 14 and I bought 400 acres of Mrs. Bush in 12, and then one of my boys homesteaded the other 160 acres. I took up the east half of east half of Sec. 14, in 1898. At that time I was a railroad engineer. I proved up the 160 acres in 1904. I bought a relinquishment of Joe Walters. He was in Texas and I think he is now. I went there to live in 1904. The Denver-Laramie Realty Company owns a portion of Sec. 6. There was 80 acres that Mrs. Bush sold to Hogue and the other 240 Hogue had previous to

506 that, I don't know how long. That was on bottom land. The rest of the section was on the hill and not very desirable land and I think it is Government land yet. On Sec. 14 of my 160 acres I irrigated the south 40 from the Hogue and Haley ditch. It runs through the south end. About the second 40 from the north end is irrigated by the Bush and Holliday ditch. I still irrigate that south 40 from the Bush and Holliday ditch. I had about 12 acres plowed on the 160 and the north 40 I used for pasturage. I used the rest of the 160, except the 80 acres irrigated, for pasture. In Sec. 13 are about 40 acres belonging to the Denver-Laramie Realty Company (formerly belonging to the Caldwell fields), with hay cut on same. Over half that section can be irrigated and is mostly all irrigated. It is pretty good hay land and is irrigated from Hogue and Haley ditch. The north 40 in the northwest corner is used to raise hay. I had to purchase a right of way through 13 to

507 put a branch in there. The old ditch was there already. I irrigate nearly 500 acres in 12, a little over, with Wymore's 40. oYu can call that either a farming or a hay country.

508 I don't consider it extra good for farming, it is good hay land. I can buy my grain cheaper than I can raise it, and

I have done that. This year I didn't cut very much hay on my land. I have never cut very big crops on my place, because I have never had water enough to find out what it would produce. On the homestead, I always have plenty of water, and that has produced over a ton of hay to the acre. It did this year. Down on the other 400 acres we are generally short. We won't make this year an average of a quarter of a ton to the acre. It won't produce without water and we didn't have it, in the early months this year. When the river is high we have plenty of flood water, but ordinary years we don't. The water that flows in the river at Wood's Landing, is used before we can get a chance to use it. This year they took so much of it into Lake Hattie is one thing that made us short, that hurt us a good deal. Then Mr. Sodergreen has a brand new ditch running full this year. They hurt us fellows down there. They got the first whack at it and took it whether they were entitled to it or not. They do generally.

This year was the first time I ever made complaint to the water commissioner, but it didn't do any good. I guess they allowed the Lake Hattie people to keep right on taking the water too. I went up there after I made complaint and I saw the water was running as lively as ever. Sodergreen's High Line was running water too. They kept on leaving me dry. There was a little water which went down my way that we didn't get this year. If my gates had been down to the river bottom I could have got the water, but I wasn't prepared for such low water as we had this year. Between the general shortage of snow in the mountains and Lake Hattie inlet and Sodergreen's High Line ditch they drew the river down so low that I could not get any at all. I had a little water about a week. The water I got was from the Hogue and Haley principally. The

510 Bush and Holliday ditch was never intended as a high water ditch. The gate lever was put down as low as it ought to have been. The ditch was never constructed deep enough into the ground so that it would draw the water from the river during the time the water was low in the stream. Before this Denver-Laramie and Northwestern got hold of this ditch I used to get plenty of water, but they put that down so low it wouldn't run over through their ditch into mine, so where I used to get pretty fairly safe on water before, since they have got that I have had to look out for myself for water. They put that down into the river bed. They can run water the year around in the Hogue and Haley ditch. This ditch was extended and the headgate put up stream before the Denver-Laramie Realty Company bought it. Mr. Hogue extended it but he just run it down a big swale there and didn't build much of a ditch. Aftr the Denver-Laramie people got hold of it, they made a good ditch of it. During the days that Hogue had it it

511 would overflow and my ditch would catch all the overflow. Then there was the Caldwell ditch, that used to be running, and there was a lot of overflow from that and we caught all that overflow from the King and the Caldwell ditch, and in years when there was plenty of water we had water anyway, whether we got any out of our gate or not, but we don't do so any more. There was

water going past our headgate in the river even this year that I could have diverted had my ditch been excavated low enough so as to drain the river at that point, but it was mighty little. There was another year that was worse than this one, 1903. That year there was no overflow from the Caldwell, King or Hogue and Haley ditches. I was short that year.

I do not have any dam in the river at the point of diversion. There used to be a dam there, but it is a pretty hard place to put a dam in, quicksand, washy. I would have to deepen my ditch about two feet or two and a half at the head to draw water from the river at a low stage. One year with another I have had high water during June so I could divert water even with my ditch as it has been. I would be able to divert water from 3 to 5 weeks during those high stages. The river channel is probably 40 to 50 feet wide at my headgate. There is only once in a very great while that the river gets out of the channel, two years since 1903. There are overflow waterways through the meadows on south side of river, but it is very seldom that they ever have any water now. When the water is up as much as the banks of the river will allow it is a tremendous amount of water. We don't get it any more. During high water the last few years the flow of the Laramie river has not been very steady. It has been quite changeable. Sometimes there will be as much again water as there is at others. I notice it pretty close, and this year particularly there were days when the water would vary pretty near half. That comes from big headgates up there, from the raising and lowering of those headgates higher up. I never complained to the river commissioner before this summer, but I had reason to.

The river commissioner never has measured the water in my ditch. I have no measuring weir. We take what we want. We raise the headgate until it will fill the ditch. That is the only way we ever measure it or have it measured, and always have done so. From the Pioneer they have a system but this is on the river bed. There has been some little contention about that on Sand Creek, where they had to shut down to allow other people to get a little water not on the river. This Laramie Plains region is a good place for oats, wheat, rutabagas, turnips and stuff like that. Yes, any stuff that grows in cold climates.

514 The principal value of my ranch is for raising hay and feeding it to stock.

We consider \$12 a good price for hay, baled. Delivered in Laramie. Hay runs from \$6 to \$8 in the stack. It hardly ever goes under \$6 that is native wild hay. I do not raise alfalfa. I do not know its comparative value with wild hay. I have bought considerable of it in the winter but never when high. I run a little dairy and when pretty good and fairly low price buy to feed my dairy. I paid \$6 and \$7 a ton, in the stack. I had to haul it about 4 miles. I get the principal return from my place from dairy cows and I raise a few horses to sell. We are milking 14 cows now. I use part of Sec. 12 for pasture in the summer. I have not sold or rented any pasture.



The going price for cattle pasture in my vicinity during the winter is about 40 cents per head per month. Horses are more. Winter pasture runs from 30 to 40 cents. That is the uniform price for all cattle, of grazing age. The going price for horses for winter pasture is about a dollar per month. A horse eats more and takes more pasture than for cattle, and horses are more injurious to pasture, they graze shorter than cattle.

516 Cross-examination by Mr. Fred Farrar:

I have never raised wheat on my place. I have never raised oats. I am 14 miles from Laramie, my nearest railroad point. The products from my ranch are limited to hay and butter. Turnips, rutabagas and so on are raised to a certain extent in the valley, commercially. They are not shipped out of here, just to Laramie for local use. We sell all we raise right here. There is no market garden in this valley for exportation. There is not a great deal of wheat. They can raise fine wheat. I saw some fine wheat the other day on Mr. Harley Grable's place. The old John A. Fischer place. Just about ready to cut. He has some fine oats too. That is on Sec. 17-14-75. There was probably 15 or 20 acres of wheat.

517 There isn't much wheat raised. There are more oats raised than any other grain. We don't raise much hay on the plains, just the river bottom. Over the plains hay and oats are the principal crops. My land is all river bottom land and not as favorable for grain as the plains. It is different soil. I could raise oats there. I have not done it on account of the late irrigation. I find it cheaper to buy my oats than to raise them. I buy of people on the ditch. Of my neighbor. I bought my oats this last summer from Harley Grable. He is under the John A. Fischer ditch. I bought these oats threshed.

518 I was short of water this May. I think they were then putting water into Lake Hattie. They were putting water in Lake Hattie in June when I was up there. My complaint to the water commissioner didn't help me any.

I bought oats in previous years from Charlie Osterman and Johnny Barth. I bought 12 or 13 tons threshed of Johnny Barth one time, raised on the Hogue farm. I fed them to horses, 35 or

40. I generally keep from 10 to 12 work teams. In the winter I pasture my horses on Sec. 12 and in summer on the north

519 side of Sec. 12. There must be 100 acres, over on the side of the hill and the river runs through. It is not meadow land and we use that for pasture. I own that land. This last year I had half a section 2 also. I didn't pay anything for it. It belonged to my mother and I done some fencing and fixed it up for her and had the use of the land. Final proof is made but she has not got her patent yet. It is a homestead of 160 acres. She had half a section but relinquished it on account of water. In other years I pastured my horses on railroad Sec. 1. It is fenced. I owned it. I sold it but

520 had the use of that two years after. I ran my horses there except my work horses. I had 10 or 12 horses and part of the time 35 or 36 cattle in this pasture, I could not say how

long. I buy and sell cattle and some of the time I didn't have any cattle, only my milk cows. I did not have these cattle in there during all the season, I would run them on the meadow after the hay was cut. I would put them in this pasture about the middle of May. I kept them there until July. I had pretty nearly enough stock in there to consume all the grass. This is the first year I have ever run my cattle in that pasture. I had lots of outside pasture there in other years. We used to have Sec. 2, a Government section

we used to pasture. It was fenced. Then there was half a  
521 section in another field that Hogue called the hog pasture.

I think it is a part of Sec. 6, Government land. There has never been any water on this land in Sec. 2 which my mother took up as a homestead. It could be irrigated from the Pioneer or Fisher ditch or from the river. Just grazing is all I consider land in this section good for, the way the water business is now. I have 560 acres. One of my boys has 160 acres in homestead in Sec. 12. I consider my 560 acres worth \$25 an acre. That includes land, improvements and water rights. I would sell. I listed it with brokers at \$35 an acre two years ago. I would not take \$20 an acre for it. My assessment is about \$6 an acre. That don't really fix the value that I would put on it. A man would have to give me what I thought it was worth. About two years ago I was offered \$15 an acre for that place and refused it. I would feel the same today. Land has gone higher during the last two years. Land has sold as high as \$50 or \$60 an acre on Riverside ranch. I couldn't give the description of the land that was sold. There is a lot they claimed to have sold at that price. I suppose the Denver-Laramie Realty Company sold the land I mentioned. As I understand, the biggest part of the Riverside Ranch has been sold by the Denver-Laramie Realty Company. To my certain knowledge there is only one family to whom the land was sold that is living there. I have a letter from a couple that claim they bought land there and wanted me to look after it for them. I could not give you their names and addresses because I never answered their letters. I don't know what lands they bought.

524 Between 1898 and 1904 I made my home on the ranch.

I worked on the road part of the time and was out there sometimes as high as three months at a time. I was an engineer on the Union Pacific. Part of the time I was working extra. I was down in Kansas once for three months. I lived at Medicine Bow for five years, then I liver right in Laramie until 1898. I was on the railroad until 1904.

ANGUS SUTHERLAND, a witness in behalf of Complainant.

Direct examination by Mr. N. E. Corthell:

524 I have lived in Albany County over thirty years. I know the country along the Big Laramine from Laramie up the stream.

525 I worked for ranchmen along the river and for the last fifteen years have owned a piece of land, the Southwest

quarter of Section 32, Township 15, Range 74, on the river. We cut hay on about 40 acres. The hay was made from overflow from the river. Had a dam that backed the water up and did not have to use ditches. The average yield would be about 20 tons.  
 526 If the water were taken from the river it would not produce any hay. It could be irrigated from a ditch.

E. D. TITUS, a witness in behalf of the Complainant.

Direct examination by Mr. N. E. Corthell:

527 Am 57 years of age; have resided in Albany County, Wyoming, over 25 years. Prior to that had spent some years in Albany County. Engaged in ranching on the Big Laramie River from three to eight miles from Laramie for about 23 years. Superintended the Pioneer Canal 14 or 15 years. In my ranch business had experience in irrigation of ranch lands. I know Frederick Rickard's ranch. Also Bush and Holliday Ditch and the lands irrigated by that ditch. About 700 acres are irrigated in Sections 14, 12 and 13, T. 14, R. 75.

528 Section 7 had irrigation from that ditch. Mr. Hogue irrigated the land in Sections 13, 6 and 7. The Denver-Laramie Realty Company now own it. Bush and Holliday ditch was built in the 90's. The Caldwell and Gardiner Ditch irrigated that land before the Bush ditch was built. That was true ever since I have known it, which has been 25 years. I know the Sutherland tract of land in Sec. 32, T. 15, R. 74. The river runs through it.

529 Part of that land is irrigated by overflow. 50 or 60 acres. He has always cut hay there. The irrigation is artificial. A dam is put in the river and raises the water so that the water does not have to get high in the river but flows over the land. The dam belongs to the Heart Ranch. The first dam was put in 23 years ago. I built the present dam six or seven years ago. In Section 11, T. 14, R. 75 there are lands irrigated in the same manner, but without a dam. Hay is put up there. Other lands down the river in Section 12, T. 15, R. 74, are in the same condition.

530 Quite a good many tracts along the river are in the same condition. They produce the best and biggest grass, more per acre, than the other irrigated lands. That irrigation is largely seepage and overflow. Were the water withdrawn from the river they would not produce grass. In dry years they produce only about a fourth as much as in normal years. I have known the Heart ranch for 37 or 38 years. Worked on it at one time and lived in the vicinity.

531 In the spring and summer of '77 and '78 I worked there and the lower part of the Heart ranch was irrigated through a ditch called the Bilderback ditch, or at that time may be called the Hutton ditch. Bilderback enlarged it. It irrigated land in Section 28, south of the river, practically all of Section 33, most of 34, nearly all of 27, about half of 26, 160 acres in 35, nearly all of 23 that is south of the river and a portion of 22, all in Town-

ship 15, Range 74. The lands mentioned are a part of the Heart ranch. Four or five years ago the Realty Credit Company and Mr.

Buntin became connected with the property.

532 The Wyoming Central Land & Improvement Company owned it at one time. Haley had it at one time. Charles Hutton first had it in shape. The Laramie Plains Land & Cattle Company owned it at one time. All of the lower lands next the river in Sections 28, 33, 27 and 14 were irrigated by overflow, that is by throwing dams into the old river beds of manure and dirt it raised the water and spread it out from one old river-bed to another. In that way practically all the land was irrigated that is now irrigated. They irrigate now through ditches because they could not get the waters out in any other way. This was largely caused by the drawing off of water by the Sky Line ditch from the head waters of the Big Laramie.

533 Also some seasons we have been short of snowfall. In the irrigation now the water is carried out in one large main ditch. It spreads the water on Section 33 and it flows down through and over 34. The Bilderback ditch was extended and connected with this larger ditch. That ditch is sometimes called the Richards ditch and sometimes the Dowling ditch. The present system was completed about seven years ago, maybe longer. I built the dam myself.

534 It is a crib and rock dam and raises the water about two feet, which turns the water into the ditch at any stage of the flow. The dam is on Section 32, T. 15, R. 74. The land slopes east and a trifle to the south away from the river. The fall is six or seven feet to the mile eastward and about three feet to the mile southward. That ditch also irrigates land in Sections 26 and 13, same Township and Range, and in Section 7, Range 73; also practically all of Section 33, all but about 80 acres of 34, all but about 20 acres of 27, 160 acres in 35, maybe 200 acres; the Northwest quarter of 26, 100 acres in the Northeast quarter of 26, 140 acres in the Southwest quarter of 26, and 25 in the Southeast quarter.

535 The river runs through Section 23 from the Southwest corner to the Northeast. All of that lying South of the river except 80 acres has been irrigated for a good many years. That North of the River is irrigated from the Pioneer Canal and from the old Penitentiary Ditch, sometimes called the Walcott ditch. That makes 3100 or 3200 acres. They were bottom lands on the North side of the river on the Heart ranch. When I first knew the ranch the low lands lying close to the river in Sections 28 and 32 were irrigated by overflow, and also in Sections 22, 23 and 27. The Walcott ditch covered 23 and 14, the bigger portion of 23 north of the river and about 240 acres in 14. There were also small pieces in 32. There is probably 350 acres not including 23 and 14. In Sections 23 and 14, 200 to 300, maybe 400 acres, is covered by the Walcott ditch, making in all 600 to 750 acres on the north side of the river irrigated from natural overflow and

seepage or by the Walcott ditch. Walcott ditch was there when

I first knew the property.

536 The land under the ditch is low land and used to be overflowed every year. That was true when I first knew the property. In the ranch when I first knew it there was 3100 to 3200 acres irrigated on the south side of the river and 550 to 600 acres irrigated on the north side of the river. They have been irrigated since that time. Since then a flume was built in 32 taking water from the extension of the Bilderback ditch joined with the Dowling ditch. It crosses the river and they propose to cover this same low bottom land with a ditch clear down through those lands on that side of the river, to make up for the irrigation those lands formerly got from the high water that they don't get now. All the lands will be watered from one dam and head-gate.

537 These changes have been made necessary by the taking out of other ditches. When I first came there were no large ditches. The original Pioneer was started when I was first in the country and completed and distributed water over the lands that the present Pioneer covers as far as its capacity would carry. I came back here in '88. Understand the present Pioneer was completed in '85. It was completed when I returned and was distributing water to all the lands lying under it. That tends to draw on the high water, and then the King ditch, the Fischer ditch, the Riverside No. 1 and No. 2, the Sodergreen ditch, in fact all of these ditches take out more or less water, and the Hogue and Haley and the Bush ditches, they all take a little water, and it makes a big lot of water when you get it together. Those diversions are all above the Heart land and lower the river, requiring the change from a system of natural overflow to a system of dams and ditches on the Heart ranch. The upper lands on the Heart ranch have always been hay lands with the exception of a small tract in 27. There is some plowed up there and grain raised on it and a portion of it seeded in alfalfa. With that

538 exception it is hay. On account of lack of water the hay crops have not been as good in late years, excepting last year. In the earlier years the lower end of the Heart ranch produced from 1400 to 1800 tons of hay. The lands of the Denver Laramie Realty Company embrace Sections 18, 19, 7, 8, 17, 20 and 5. Practically all of it is irrigated. It is in the same range and extends clear up Sand Creek. These lands were originally covered by the overflow, that is the very low land. Fifteen years ago Hogue built the Hogue and Haley ditch and before that of the waste water from the Caldwell and Gardiner ditch carried on down to this land.

539 At a rough guess there are more than 2000 acres irrigated, nearer 3000 acres than 2000. It has been under irrigation ever since I have known it, first by overflow, later by the Hogue and Haley and the Caldwell and Gardiner ditches. All of these lands in the Heart and Denver-Laramie Realty Company ranches are irrigated from the Laramie River; 2000 to 3000 acres of the Denver-Laramie Realty Company land and 3650 to 3850 of the Heart ranch proper.

## Cross-examination by Mr. Fred Farrar:

Practically all lands that formerly overflowed are now under ditch. The eastern portion of the Heart ranch now belongs to Buntin and Talmadge. The upper portion to the Denver-Laramie Realty Company. The Buntin and Talmadge people acquired title  
540 about four years ago. I leased part of it myself for the last 7 or 8 years. I don't think that transfer had any connection with the Talmadge Company project down the river. This land up here was owned by the Wyoming Central Land and Improvement Company and the land down the river was sold to them by Ora Haley. I think they bought the Heart ranch a couple of years after they bought that land down there. Some of the Heart ranch has been irrigated in later years, but was not. The Pioneer, when built, practically covered the land on north side of river. The Dowling and Bilderback ditches are not serving more land now than they were a few years ago. The Cole ditch is not now connected with the Bilderback or Dowling ditch, coming from the river in Sec. 28. Originally the Cole ditch was an extension of the Pick-up Bilderback. By Pick-up I mean that the Bilderback ditch runs from 33 along the north edge of 32 through 27 to the northwest corner of 26 and dwindles out down in 23. Commencing at a point a little east of the quarter rock on north side of 26 is a ditch runs east about 400 yards and then skirts around above the rising ground and passes out about 400 yards into 24 south of the northeast corner of 23 extends across the northwest corner of 24 and across 13 and is carried across Five Mile creek onto what is known as the Cole land, lying east of Five Mile creek in Sec. 13. That is the Pick-up Ditch. Commencing at the quarter corner of northwest corner of 26 is a dam thrown across to pick up the water. There are old river beds and the ground is low, as it is a mile west of there. It was built by Hutton to irrigate the land in 13 and 23 under it. When Cole took up lands in Sec. 13 he built a ditch into the river about 800 yards north of the south line of Sec. 22 and about a quarter of a mile east of west line. That ditch extended down across 27, following the slough and connected up with this dyke or dam that extends from the quarter rock on the corner of 26 to the foot of the hill. They made a complete ditch from the river, but he could not hold his headgate, so they went on up into 28, followed the sloughs on up in there and they now take water out at that point. This Pick-up ditch was first designed to catch the water that was turned out by the Dowling ditch headgate and the ditch that distributes onto 33, 34, portions of 35, 27, 23 and 28.

When I first knew of the Heart ranch, the customary method of irrigating was to throw out dams in the old river bed, or dams  
542 through the meadows. The overflow from the river was thereby diverted across and upon the meadow. All the irrigated lands in this country were irrigated that way. When I first came here Hutton had gotten out a ditch. The Bilderback ditch was first known as the Hutton ditch. It was before I came here in spring of 1877. He built that ditch to get water out of those old



river channels. The overflow was not diminishing at that time, it was to extend it and get more water onto the land. I have noticed the overflow diminishing more particularly in the last 15 or 16 years. There have been ups and downs in the flow of the river. There has been very high water. I saw as high water here about four years ago, nearly as I ever saw. The normal flow has been diminishing for the last 20 years nearly, on account of taking out new ditches. There are times even yet when we have an overflow. There has been one instance, I think four years ago, that the river rose and covered all these bottom lands it used to cover in years past. There has been very little overflow only the low bottom lands right close to

543 the river have been covered since that year.

The main Hutton ditch in 1877 was about a mile and a half in length. There were quite a number of laterals running from it. There was a headgate in it at that time near the quarter rock on the west side of Sec. 33, between it and the northwest corner of Sec. 33. That ditch did not run almost parallel with the river, it run south and east and then turned and ran north and east, a little north of east. It ran in a southeasterly direction about a quarter of a mile and then turned northeasterly and followed the general direction of the river.

The Dowling ditch was built about 23 or 24 years ago. They wanted to enlarge the Bilderback ditch covering practically the same lands and figured it was a better place to take water out above than where the Bilderback ditch did, on account of the river changing and leaving their dam in slack water time practically high and dry. The overflow waters were beginning to diminish when the Dowling ditch was first built. The headgate of the Dowling ditch

544 is between the quarter rock on the west side of 33 and the northwest corner of the section. The headgate of the Hutton or original Bilderback ditch was then extended up to the head of the Dowling ditch, probably 6 or 7 years ago. I built the ditch myself.

I saw the Sky Line ditch about 6 or 7 years ago. I first saw it about 8 or 10 years ago, the first time I was up in that country hunting. I wouldn't say definitely how long it was. I was right at the Sky Line. I probably did cross it. I did not see any water in it then. I am fairly well acquainted with a man connected with that ditch and would meet him quite often, and I could always tell when they turned in water up there, because about a week afterwards that would show down below here. The water would constantly drop in the river. The Sky Line ditch heads in Colorado out of Big Laramie river. The stream from which it heads is not very large, not as large as it is down here. The stream is considerably larger down here. I have seen streams quite a bit smaller than this stream where it heads. I have been at the head of the Sky Line ditch, where it leaves the stream. I am not able to give you the branch from which it takes water. It is capable of carrying about 150 second feet of water anyhow. They take water in it along the last of May and during flood waters through June. Quite often they shut down for repairs on that ditch. There is such a creek as

the Rawah creek, but which creek it is I could not tell. I probably have been right on it and along it. I think it flows into the Laramie below the Sky Line ditch. There is such a stream as the Deadman. I probably have seen it. I could not tell where it comes into the Laramie river, because I always went up in that country through Sand Creek. There is another tributary known as the McIntyre. There is a stream known as Grace creek which runs into the Laramie at Grace creek ranch. There is La Garde creek. And Jimmy creek. I do not know whether there is such a stream as Stubb creek. I have heard such creeks all called, but never paid any attention, as I was after deer. Some of these streams are tributary of the Big Laramie

547 river in Colorado below the Sky Line. That is they are down stream from the headgate or diversion point of the Sky Line ditch. There are several others up there, Woods Creek and Fox Creek, in Wyoming, and Johnson and Beaver creeks. I am able to tell from the flow of river here when diversion of water through the Sky Line canal begins. When they shut down for repairs it would always show down here. It would be close to 100 miles, to follow all the crooks of the stream from the diversion point of the Sky Line canal to the headgate of the Dowling or Bilderback ditches. There are two or three branches on that upper end of the Big Laramie. There are lots of creeks there but I don't know one from the other until you get down to Grace creek. I could see lots of snow and drainage country that drained down in there clear on down beyond where I saw the head of the Sky Line ditch,—drainage that came off in the southwest there to the northeast. That is where the big snow is up there. I do not know the altitude

548 of the headgate or diversion point of the Sky Line ditch. Timber line in this altitude is about 10,000 feet. 10,000 to 11,000 is about as high as timber grows. The headgate or diversion point on Sky Line ditch is below timber line. There is timber all around there,—pine, willows and brush of all kinds. I wouldn't say positively that the difference in the flow of the stream, which I have attributed to the flow of water through the Sky Line ditch was due to the diversion of water through that canal or due to a diminution in the amount of water occasioned by the melting or delay in melting of the snow of the lower area. W. G. Decker, connected with the Sky Line ditch, was one man I talked with about the matter and told him at the time of the sudden rise in the river. The water came down and then ceased to be so high and dropped back to the stage it was before. He told me to shut it off. That was about

7 or 8 years ago. I do not know who owns the Sky Line 549 ditch. I supposed Decker had charge of the diversion of water up there at least from what he told me and from seeing him fixing up his box, etc. Then he was making his headquarters up there. I met at Sodergreen's. Aside from this time I have known the flow of the river to be affected by diversion of Sky Line canal. Whenever water would be turned into that ditch it would make a sudden drop in the river by the time the slack got down there. The fall would be sometimes a couple of inches, sometimes 4 inches. If the river was low it would drop that much more. The river is highest

in June. The high water gradually comes up about the middle of May or a little before, gets to its extreme height here along about the 15th to 18th of June, and then suddenly drops off. It was in that flow that I would notice the diminution when the Sky Line was started. In the latter part of June, when the high water would be past, I would do repairs at the old dam we had at the Pioneer headgate to get a head into the Pioneer. If they shut down for repairs up there I would notice it very quick. I have never been at the diversion point of Sky Line in high water time only in the fall,—once at that point, but around Chambers Lake two other times. I have been

at the headgate or diversion point of the Sky Line canal once.  
550

The flume which crosses the river and takes water from the Bilderback ditch on the north side will go above the Walcott ditch. That flume was built this summer. No water has run through it. I first saw the Walcott ditch in 1876. That is called the old Penitentiary ditch. It heads from the river in the northwest of the northwest corner of Sec. 26-15-74, about  $\frac{3}{8}$  of a mile. It is within 100 feet of the northwest corner of the southeast quarter of the southeast quarter of Sec. 22, the same point as when I first saw it. There is no headgate but the old original dam is there. That ditch is used to take water in high water times. It was a low water ditch when it was built. Now water can run out of it only in

high water time. It was built primarily to carry water across  
551 the river to the Penitentiary lands in west half of Sec. 32, Tp. 16, R. 73. The Walcott ditch is not now used to carry water as far down as the old Penitentiary land, but only to Sec. 23. The lands it covered have been covered by the Pioneer ever since it was built. The Walcott ditch is only about a mile in length—all the way down through Sec. 12. I used it in Sec. 12 to distribute water from Pioneer. The headgate of Walcott is all rotted out, and the ditch is in disrepair, and has not been cleaned out in years. The lands are covered by Pioneer. The Walcott as diversion ditch from river, was practically abandoned, when the Pioneer was completed, and it took water onto those same lands through the Pioneer.

#### Cross-examination by Mr. Delph E. Carpenter:

I gave the portions or tracts of land irrigated by the Dowling and Bilderback ditches. In 1877 these ditches were taking water from river over these lands which constitute a flat portion of the Laramie Plains lying right next to the river and only a few feet above it along the east bank. That flat was evidently made by the filling in of sand and gravel and silt,—river wash. There are evidences of old river channels all through that flat. In the upper portion in Sec. 32, 33 and 34 these channels run east, are very numerous and can easily be traced. In Sections 35 and 26 they turn nearly north. The river, in ages past, used these channels as its water course. They have filled up with silt and sediment and you can now go right over them anywhere with a mowing machine. These old river beds are misnamed when called sloughs, which generally have water in them all the time. These do not. The ground is a foot and a half to two

feet higher between these old channels than it is in the bottom of the channel. These old channels have not been exactly used by the irrigators as lateral ditches. They put in dams of earth and manure at a favorable point and raise water up and throw it out onto the higher ground on each side. Then the water would come back again. Another dam would then be constructed. These channels are from 40 feet to 100 feet in width, some 150 feet. They hold water from half a foot to 2 feet in depth while it is being dammed up to force it out over the adjoining land. The water in them is backed up and standing still except where it flows out over the higher ground. It looks more like a lake than a river when the land is under irrigation. In the northwest corner of Sec. 26 the water plane is about  $4\frac{1}{2}$  feet below the surface. In places in 33 and 34 it is not over 3 feet, and in other places it is 5 to 6 feet. Some of these channels run close together, paralleling each other, and some of them cross each other. Some are 300 or 400 yards apart. Some cross the old river channel almost at right angles. Wire grass or water grass grows in these sloughs. That meadow there is nearly all wire grass and a little red top mixed in. On the extreme high upland it is kind of flat blue grass and wire grass that we consider the best hay in this country.

The Braden ditch or Dowling ditch heads pretty well up toward the south line of Sec. 32 and flows southeast from there. Its dam holds up the water for the Sutherland land. It sub-irrigates it and irrigates it in high water season. That ditch is used for the irrigation of this land on east side of river now. The Dowling ditch and the Bilderback ditch start at the headgates of the Bilderback ditch, running a little bit north of east until it connects with the old Bilderback ditch near where it originally came out of the river. Practically all of Sec. 33, except what is in the river channel, is irrigated from this ditch. From 160 to 200 acres in Sec. 32 are irrigated from it. Not to exceed 80 acres in Sec. 34 is under irrigation. That portion not irrigated is on the southeast side of the southeast quarter

There are about 180 to 200 acres irrigated in Sec. 35.

All of the northwest quarter and 100 acres in the northeast quarter and about 160 acres in the southwest quarter of Sec. 26 are under irrigation. All of Sec. 27 except about 60 acres is irrigated. Nearly half a section, less 80 acres, is up on the high ground in Sec. 23 and is not irrigated. Pretty close to 300 acres in Sec. 13 are irrigated. The Cole ditch is the same as the Bilderback ditch. These lands above described go to make up the acreage of the 3100 or 3200 acres irrigated from this Dowling and Bilderback system. Along through 23 and 13 on this river wash and sand and gravel, in a strip next to the river, they get their very best hay.

I never saw over 1000 tons of hay put up over this acreage but they tell me they put up more than that when Hutton ran it. Some years they use it as pasture and don't cut any hay. Other years they cut just the best half of it. About 15 or 16 years ago they used it for pasture. Homer rented it for cattle 3 years and used it for pasture. He irrigated it and ran 1500 to 2000 head of cattle in

there. Sutherland ran the place about 14 years ago. Some of the meadow land he used as pasture and some he cut hay from. When they were cutting the very heart out of the hay they were getting from 400 to 500 tons. I do not know what they paid for those meadows for pasture. As meadows, without pasturing them under the present of irrigation, they would produce 600 tons or more of hay on an average year. The lower field last year put up nearly 300 tons. My boy put up 380 tons on shares last year on that land. That was an extra good crop year. The lower field would average that. Hard to state what the whole tract would average, one year with another, for native hay, if used exclusively for that purpose, for the reason that they never cut all the hay. First this man has it and cuts the hay, don't know the method, strikes a little rough ground and runs around it. It is good hay but too rough to run his machine in. He strikes another rough spot and the same thing happens, lots of hay is left in the fields, never cut, just as good as that cut. If it were all cut it would cut on an average of 1000 tons of hay over the entire area, if brought up to its highest development as a meadow. I haven't figured the hay in 23. I have had a lease on that from the Wyoming Central Land and Improvement Company until this year for 7 or 8 years, the terms of which are a personal private affair, for ranching and hay. I pasture portions of 14, portions of southeast half of 15 and I raise grain on southeast half of 11 and alfalfa on portions of 14. I put up 116 tons of hay on about half a section of that land. About one-half a ton to the acre is a pretty fair average. Every ditch on these lands now was drawing water in the eighties. With the exception of the Cole ditch, that ran right in there through the irrigated land, when he extended that on up to the river, they have been operating since the latter part of the seventies. Cole built the ditch to get the water directly from the river to his land. He caught the overflow of the other ditches. Since those ditches were constructed, and even now, the land is watered by manure dams in the old riverbed. They use the same methods of irrigation now that they always used. This land is primarily valuable for wire grass hay. I think they could make more money if they put this land into alfalfa. The water plane is pretty close to the surface. There are 10 to 20 acres that are good for alfalfa. That land is higher than the lowland is in those old river channels. Those low river channels are primarily adapted to wire grass. Taken as a whole the meadow is valuable for that purpose. If I owned it I would thoroughly ditch it in a proper manner. Throughout all the western states there are spots along the rivers that are naturally overflowed originally. That bottom there was  $2\frac{1}{2}$  miles wide. The first time I ever saw it in the spring the water spread clear across from the foot of the hill to the ranch buildings. It was the same on other streams that I have seen,—the Little Laramie, the North Platte Valley. Don't know much about the South Platte. As years went by and they took to using the water of the streams for irrigation of land entirely, they cut off this high overflow. When they began

to take water back on the highlands to distribute it takes a long time for that water gradually to get back to stream. After the construction of these other ditches men who owned meadow land simply constructed ditches to irrigate meadows. A much greater benefit was had by taking out the other ditches and making the new ditches than would have been received had they simply allowed the water to flow on down the river and overflow these small meadows. The greatest good to the state in which these streams were, has come from the construction of irrigation ditches. The small amount of real bottom land along the streams is the easiest land to irrigate. There is practically no difficult construction in making the ditches. In these meadow ditches the water is applied almost as soon as it gets away from the river. It differs in that regard from the canals on the higher land.

None of the meadow ditches on the Big Laramie river are over a few miles long,—the Riverside ditches about 4 miles. They cover the bottom land as well as the first bench which is but a little higher portion of the bottom land. Even on the first bench you notice these depressions or channels running here and there across them back into the stream. When lands are watered even here they overflow the higher portions and gather in these lower depressions and go back toward the river. It is that way on Riverside ranch and all lands along river. In fact, everything between the bluffs  
562 proper, everything in the floor of the river valley is marked by these characteristics. Underneath these river bottom meadows and pasture lands the soil is usually a river wash of sand and gravel. Water which sinks down into them simply goes into the water plane of the stream.

Some lands which originally belonged to the Heart ranch were later acquired by the Denver-Laramie Realty Company and some 2000 or 3000 acres of that land now belonging to the Realty Company and formerly belonging to the Heart ranch was irrigated from the Laramie river. Quite a considerable of that land was formerly owned by Mr. Hogue. He obtained the upper portion of the Hutton home ranch or Heart ranch when it was divided up. There never was enough water from Sand Creek to thoroughly irrigate it. I have heard the Dowling ditch called the Richards ditch after Richards surveyed a ditch from the Hutton Lakes a number of years ago, but it never was constructed. Richards did the earth-  
work on the Dowling ditch. He was general foreman of the  
563 ranch at that time. A considerable portion of Sections 18, 19, 7, 8 and portions of 17, 20 and 5 were purchased by Mr. Hogue. The bigger portion of that land was originally irrigated by Sand Creek overflow. Sec. 7 and the west half of 18 were irrigated from old Calwell, which came onto Sec. 12. Water was carried on into these lands on the Heart ranch in a similar manner to which water was spread on the fields lower down. The land was so flat that they wasted the water over from the lands under the Caldwell ditch and it flowed over these sections. A great deal of water came from the Caldwell ditch into the Hoge holdings. Ever since Hoge built the Hoge and Hailey ditch, these lands have been



irrigated from that ditch. The northeast quarter of Sec. 18<sup>th</sup> was irrigated by old creek channels that run through. They were made into ditches. They obtained their water from the overflow that came down into Sand Creek from Caldwell field and Caldwell lake. The only ditch of which I know that comes out of Sand Creek and irrigates land on the east side of Sand Creek, came out in the township west of that in range 75. It irrigates a small piece of land but whether it is called the Wright ditch or not I could not say. It is between the river and the creek. I do not know of a ditch called the Wright ditch taking water out of Sand Creek to irrigate the northeast quarter of that section. There is these old creek beds. The creek has changed backwards and forwards through these lands. 22 years ago I saw George Hutton at work on these old creek channels and cleaning them out and distributing the water. Sec. 19 is irrigated by the Hoge and Hailey ditch. The Caldwell overflow comes into Sandy Creek and then is picked up by these old creek channels and distributed all over these lands. One principal branch of the Caldwell ditch follows the river miles away from Sec. 19. One branch throws water into what is called Caldwell Lake, an artificial lake made by overflow from irrigation. It probably covers about 160 acres. Water was run from the river through the  
565 Caldwell ditch and into that lake from irrigation. It has been there for many years. There are times that it goes dry.

It fills next season. It acts as a reservoir for those lands east of there. There is no ditch out of it, it carries through underneath by sub-irrigation. There is greasewood land in there, underlain with sand and gravel and it will run in there. Sometimes the sand and gravel is 6 inches from the surface, sometimes 2½ feet of pure sand and gravel. A few inches of that sticky Billings soil, if mixed with sand and gravel, will make it impervious to water. Water goes into the ground. There is always a thin spot where you strike sand and gravel. In digging post holes there are places where it is only 2 or 3 inches through that sticky stuff, into the sand and gravel. There are places where it is a couple of feet thick.

566 The sand and gravel practically come to the surface in a great many places in vicinity of Caldwell Lake. This water simply percolates out of the lake and through the sand and gravel and back into the river.

The Sand Creek ditch irrigates a narrow strip of land between the ditch and Sand Creek running north from the Hutton lake to the river, no place over 150 yards wide. The bulk of the water comes from the Laramie river through the Hoge and Hailey and Caldwell ditch, for the irrigation of Sec. 19, the east half of 18, all irrigated lands on 17 and 8, and on Sec. 5, west of Sand Creek. The Caldwell ditch not only had water enough for its own land, but enough to overflow and irrigate this other land.

The Walcott ditch, shown as heading in Sec. 32, Tp. 15, R. 74 on the three maps attached to the publication entitled "Advance sheets of field operations of the Bureau of Soils, 1903, U. S. Department of Agriculture, soil survey of the Laramie Area, of Laramie,

Wyoming, by N. D. Neill and party," is an error. That was evidently intended to indicate the Dowling ditch.

567 Between 2000 and 3000 acres of the lands under irrigation, and making up the upper portion of the Heart ranch, were sold to Hoge. I have seen more than 1000 tons of hay  
568 out there from land watered by the Sand Creek ditches, the Caldwell and the Hoge and Hailey ditches. That meadow compares quite favorably with the meadow under the Dowling ditch. The Hoge land has not been abused like the lower lands have by pasturing it with water on it. This Hoge land is best adapted for raising native hay.

I paid in the neighborhood of \$200 a year cash rent for Sec. 23.

R. E. FITCH, a witness in behalf of the Complainant.

Direct examination by Mr. N. E. Corthell:

569 I was formerly engaged in ranching; now engaged in real estate and insurance. Live at Laramie, Wyoming. Have lived forty years in the county. I ranched nine miles north of Laramie on the Big Laramie River. Have had occasion to know a good deal about irrigation along the river since 1872.

570 The first settler that used water from the river was Catherine Erhart in 1873. She still occupies the place. She has irrigated about 75 acres. The next settler, James Coughlin, irrigated about 100 acres from the river from 1880 to 1909. His sister Maggie Coughlin owns the land since 1909 and irrigates about 50 acres. David Salisbury irrigated about 45 acres from 1880 to 1894; then M. E. Sticknel took the land from 1894 to 1903, irrigating the land. Noah Wallis irrigated about 70 acres from 1881 to 1900. Ed Farrell irrigated about 60 acres from '73 to '75.

571 N. F. Spicer occupied the same land 1880 to 1883 and irrigated 80 acres; C. L. Huston 100 acres including the same land, '83 to '93. J. J. Fisher occupied it from '93 to 1904. Then H. Maynard from about 1904 to the present time, irrigated about 100 acres. Valentine Spindler occupied the land from '73 to '84, irrigating 75 acres. Herman Clerk from '84 to '87 irrigated 50 acres; J. J. Fisher, '87 to 1904, 60 acres. Maynard occupied the land from 1904 to the present time, irrigating 50 acres of this land. Ed Brady a little further down irrigated 75 acres from '72 to '77. Don Cameron irrigated about 90 acres from '77 to '80. Caldwell & Fitch, from '80 to '82, irrigated about 90 acres. In the same vicinity Brocker and Brammer irrigated about 300 acres from '75 to '83. Fitch and Stark irrigated about 1200 acres from '82 to '86; R. E. Fitch from '86 to 1900 about 1000 acres; R. E. Fitch from 1900 up to the present time, about 200 acres. T. D. Abbott occupied land there from 1879 to 1885 and irrigated 1000 acres. Abbott & Shears from '85 to '89 irrigated 1500 acres. The Haley Land & Live Stock Company then took this property and with other

land occupied by them from 1889 to 1909, irrigated something like 3000 acres. These dates and figures are not absolute.

572 All that I have mentioned has been taken from the Laramie River direct. Mrs. Erhart was located on Section 16, T. 16, R. 73; Coughlin Section 9, same township and range; Salisbury in Section 8. Stickney the same land that Salisbury had; Wallis in Section —, T. 16, R. 73; Farrell in Section 4, T. 16, R. 73; Spicer same section; Huston same section; J. J. Fisher and H. Maynard in Section 4, T. 16, R. 73; Spindler in Section 32, Township 17, Range 73. Clark, Fisher and Maynard occupied approximately the same land. Brady was on Section 24, T. 17, R. 74. Cameron occupied the same practically and Caldwell & Fitch and Bocker & Brammer occupied land in Section 24, T. 17, R. 74 and in Section 13, same township. Fitch & Stark also irrigated land in Section 24-17-74 and in Sections 13 and 25 in 17-74. R. E. Fitch irrigated the same land during the time stated and at the later date, 1900 to 1913, only in Section 24. T. D. Abbott occupied land in Sections 2, 3, 11, 12, 13 and a little in 14, T. 17, R. 74. Abbott & Shears occupied practically the same land. The Haley Land & Livestock Company, or Ora Haley, irrigated lands in, although not all of, sections 2, 3, 11, 12, 13, 14, 5 and 6, in T. 17, R. 74.

573 Taking out all duplications in T. 16, R. 73, there were approximately 500 acres irrigated; in T. 17, R. 73, 75 acres; in T. 17, R. 74, close to 3000 acres. These other two townships north I approximate at 3000 acres. I think there was more land than that irrigated. My ranch is located in T. 17, R. 74.

574 These people who irrigate successively the same tracts were successors in title. I should say that these lands have been irrigated to my knowledge from 1872 to 1913 practically continuously, not all the same year, however. These lands are all irrigated directly from the Laramie River and not from the Pioneer Canal. The method of irrigation is still primitive and becoming more systematic and scientific. In early times we had very meager laws on the statute. It was a very much go as you please proposition. The irrigation was largely from natural overflow. After that, when they didn't have quite so much snow, the water would be impounded in little sloughs and natural ditches and utilized in that way. When the high water flow ceased, people had to be more systematic and constructed dams and ditches and headgates and utilized and watered in a more economical way.

575 In some of these smaller tracts that I have mentioned I don't think they have yet gone into very elaborate irrigation work. In other parts considerable amounts of money have been expended in constructing ditches, dams and head-gates, and the waters used in that way. The early ditches were never on record so far as I know. I know the Oasis ditch. It was started about 1884. Some work done on it as late as 1907. That ditch covers something over 12,000 acres. There are no new ditches being constructed because those existing are adequate to supply the settlers, I think.

576 They raise hay always, alfalfa, oats, rye and potatoes and all kinds of vegetables. I am nearly 70 years old.

## R. E. FITCH.

Cross-examination by Mr. Fred Farrar.

576 I live in Laramie, engaged in real estate and insurance business. The memoranda from which I refreshed my memory was prepared August 30. The first ditch taken out of river below Laramie is called the Martin ditch, somewhere in Sec. 16, Tp. —, R. 73. It irrigates the Erhart place, about 50 acres.

577 I could not state that it was in use from 1880 to 1890. These primitive methods included taking water out of the river in any possible way. I would not be certain about the nature of the ditch or headgate or anything of that kind down there. Water from the river produced hay. Just how it was taken I cannot say definitely. I have not been on that place since 1890. Catherine Erhart, who resides on the place, had some cattle when Mr.

578 Martin was operating with her. At the present time she sells in town, eggs, butter, chickens, and possibly some little garden truck. During the period when I was acquainted with the place the land was irrigated for native hay and some little garden. The land was on first bottom, the 50 acres irrigated lying contiguous to river. Hay produced on land would average generally with that in Laramie Plains.

579 I have known the James Coughlin place in Sec. 9, Tp. 16, R. 75 and had intimate knowledge of it from 1880 to 1890. I could not say whether or not they had a ditch but think they irrigated some from natural sloughs. I would not be positive that Mrs. Erhart's irrigating was not much of the same character. The method was to allow overflow water to pass over land by throwing dykes across these sloughs. They would plough furrows to carry the water when they wanted it. There was no definite system of ditching then nor do I know of any in this Coughlin land today. Coughlin irrigated about 100 acres in palmiest time of his irrigation, not continuously, but the place has not been irrigated

580 very much since he died in 1909. His sister fell heir to his property and it has been rented since and pastured. Mr. Coughlin engaged in breeding and raising horses and selling. This land he irrigated was not cultivated, except irrigation for native hay. The David Salisbury place is situated on Sec. 8, Tp. 16, R. 73. There was a little more system to the irrigation there than on the Coughlin place. He was a rather hard working old man and did a little more in the way of irrigating. He lived on the place and Coughlin was off the place. The Salisbury place was hay land principally. They had some garden patches and about 5 acres of potatoes and a little grain. I wouldn't be certain whether he raised potatoes continuously during the time I knew him. He raised grain rather periodically, just for his chickens and horses and not for commercial purposes. Salisbury did not have a very expensive

581 system of ditches. When I first knew these ditches the country was fenced just along river, the balance being open range.

Noah Wallis irrigated about 70 acres on Sec. 9, Tp. 16, R. 73.

That also was hay land. His business was stock raising, principally horses at that time. He did not have a definite system of ditches.

The largest amount of land that I am aware of being under irrigation on Sec. 4, Tp. 16, R. 73 was 120 acres, contiguous to the river, all along the river bottom, called hay land. That was in 1904. None of it was cultivated, except for garden in a small way, except across the river, and that came under the Pioneer canal and I have not been alluding to that, although it is held by same people.

582 The system of irrigating there was about the same as these other tracts. I don't think I ever saw any ditches on the east side of river where this land is situated. On west side there was a portion of it under the Pioneer canal.

The Valentine Spindler place was in Sec. 32, Tp. 17, R. 73. My most intimate acquaintance with that place was from 1880 to 1890. There were at that time about 75 acres under irrigation. I have estimated that there are not now over 50 acres irrigated. That portion along the river bottom was hay land, irrigated largely in the same way. There was some little grain raised there and potatoes and garden truck. I don't suppose there has been over 10 or 15 acres cultivated outside of the hay land. I saw most of these

583 places in a cursory way a week ago today, not in a way to explore them carefully, but to look them over. This place is not very different than it used to be. It is maintained much better than it used to be. There has been a great deal of money spent there in the last 5 or 6 or 8 years. The place where Houston was at one time interested comes into Maynard ranch now and he has charge of that and is taking good care of it. The Coughlin place has been leased and it is not so well taken care of since 1909. The Erhart place is kept about as usual. The Salisbure place is possibly not so well maintained as it was when the old gentleman lived there. Herman Clark has located on the same place where Maynard is now located, Sec. 32, Tp. 17, R. 73. That is the same as the Spindler place, enlarged somewhat. Ed Brady and

584 Don Cameron owned the same land, Sec. 24, Tp. 17, R. 74.

Caldwell and Fitch owned considerable more, a half section that was not owned by Brady and Cameron, although their holdings included same as Cameron had. Caldwell and Fitch had a contract with the Wyoming Central Land and Improvement Company for half of Sec. 13 and part of Sec. 25 and other lands, and they were irrigated by them. That is what made their holdings larger than had been previously held in the same locality. While Brady was there he irrigated about 25 acres. Caldwell and Fitch now irrigate about 90 acres. To correct my former testimony, Fitch and Stark had the contract with the Wyoming Central people and Caldwell and Fitch. It was a little later. Caldwell did not have anything to do with the land in his time except portion owned by Cameron. At the time the Caldwell and Fitch place was purchased from Cameron and for some years after it was devoted first to sheep raising and incidentally to cattle and horses. All this irrigated land is bottom hay land devoted to raising of native hay.

In my estimate of land irrigated by the Oasis ditch I did  
585 include land in Sec. 24. The Brocker and Brammer lands  
are on the west side of the river largely. They had some  
lands leased from the Union Pacific Railway Company, before the  
time of the Wyoming Central. They leased from the railroad com-  
pany on the east side. They had some system of ditches for the  
irrigation of those lands on west side of Laramie river, called the  
Brocker and Brammer ditch. It led from an old river bed that had  
been the river before the channel had changed, and it carried a lot  
of water and they took their water from this. They had a dam but  
I don't remember any headgate. Their system was somewhat bet-  
ter than some of these ranches up the river. It was more definite  
and did not depend upon the overflow so much. They had this  
means of damming the water and taking it out later after overflow  
had passed. This was hay land and upland. They cultivated some  
upland. They had a 20 acre tract of potatoes in 1880, '81 and '2,  
and up to '83. That land is devoted mostly to hay now, no  
586 cultivation on it. The Fitch and Stark place included the  
Brocker and Brammer place. That was purchased in 1883.  
All of Sec. 24, that formerly formed a part of the Brocker and  
Brammer place, is now known as the R. E. Fitch place. That por-  
tion of the Fitch and Stark place which was not included in the  
R. E. Fitch place went into the Hailey Live Stock Company, and  
has been sold since to the Talmadge-Buntin people and by them  
possibly to other people. A portion of the land included in the  
Fitch and Stark place is hay land. I have a part of Sec. 24 culti-  
vated. I haven't noticed the lessee's operations recently, but I am  
quite sure that it is cultivated—potatoes and oats principally and  
some rye, but not over 10 or 15 acres altogether. The Fitch and  
Stark lands were irrigated from the Laramie river, by a better  
method than I have described. There was a ditch taken out  
587 some distance up river and water brought down to land. It  
was known as the Cameron ditch. Afterwards it would be  
the Fitch ditch. I had more interest in it than anybody else. The  
Abbott ditch had its headgate a mile up river from Sec. 24, on Sec.  
30 in Tp. 17, R. 73. The Cameron ditch has been obliterated  
largely by this Oasis canal that ran through it and I had contract  
with builders of canal to use water from that, so I paid little atten-  
tion to other after Oasis was built. Brocker and Brammer were  
engaged in stock raising, both cattle and sheep. Fitch and Stark  
were principally engaged in sheep, some cattle and a few horses.  
These lands that were irrigated were largely hay lands. Hay was  
cut and stacked and made good use of. The stock business was  
quite extensive in that section during the years I was acquainted  
with it. Today it is a good deal of stock business though conducted  
in a different manner. There are less open range operations  
588 and more of irrigation and raising larger quantities of hay  
and forage and feeding stock in the winter and keeping them  
in the fields a large part of the year, except the sheep. In 1900 I  
irrigated about 200 acres. That is less in amount of land in that  
section than had been previously irrigated. The shortage of acre-



age was occasioned by low condition of water in river, which used to enable us to take out water in this old river bed and utilize the overflow. We didn't have that much in 1900, too much water had been taken out before it got down to us. I did not have a system of ditches which permitted me to irrigate the land, which had formerly been overflowed. The greatest amount of land on Sec. 24, Tp. 17, R. 74 which has at any time been irrigated would be about 500 acres, although I harvested over 700 tons of hay on that land. A little portion of it might have been on the outlying parts of sections 13 and 25. The average yield of hay cut in that section would vary from half a ton to, in exceptional cases, two tons, an acre. The two ton crop would be cut from land where the water conditions would be different. There was not much land on which we could cut two tons, perhaps 10 or 13 acres. A fair average yield on ordinary hay land in that vicinity would be about a ton to the acre. The yield would be about same as that which they raise on river above Laramie.

589 Mr. Abbott irrigated about 1,000 acres on the Abbott and Shears place. Originally there were about 4 sections in that place. Afterwards they extended it somewhat. Irrigation on that place was conducted by ditches and dams from the Laramie river up to the time the Oasis canal was constructed, and most of the irrigating was done through that after its construction.

The Oasis canal was constructed in 1884. It was used for the irrigation of the Abbott and Shears lands. Prior to its construction they used a canal called the Coleman ditch and the Abbott ditch. These ditches were on east side of river. They are not used very extensively today. This Oasis canal is a large structure, and brings down all the water they need. These irrigated lands were hay lands. These men were engaged principally in cattle raising and some horses.

590 These lands were largely irrigated originally from the overflow method, but they were now beginning to use ditches. There has not been a great deal of overflow irrigation in that locality since 1888 or '9. From that time on method of irrigation changed by gradual construction of irrigation ditches, not entirely but there has been an improved system. Outside of the Oasis ditch, the ditches constructed to irrigate these lands were in some instances 3 miles long and approximately a mile from the river. The Coleman and Abbott ditches were of that character. I don't remember which was the longer and further out. I crossed them a great many times and noticed their course and the condition of things.

591 The Oasis ditch is close to 10 feet wide on bottom and 12 feet wide on top. It is more than 18 miles in length. The Coleman and Abbott ditches are now abandoned, and the lands are now irrigated from the Oasis ditch. The headgate of this canal is in northwest quarter of Sec. 30, Tp. 17, R. 73. Commencing there the following lands are irrigated from the Oasis ditch: The East one half of Sec. 24, Tp. 17, R. 74; pretty nearly all of Sec. 13; practically all of Sec. 12, the east half of 11, all of 2, about all of 3 and a part of 5, in the same township and range. About one-half

of 5. There might be some contour of the surface in there that I don't remember that might affect this matter of irrigation. The northeast quarter of Sec. 6 that is all in Tp. 17. Now Tp. 18—there would be the east half of Sec. 31; about  $\frac{2}{3}$  of Sec. 32, about one-half of Sec. 27; nearly all of Sec. 28; the east half of Sec. 29; pretty much all of Sec. 21 and Sec. 22. The country is rather flat along course of the Oasis ditch. I don't think that fall of  
592 ditch would be much over 2 feet to the mile. The general slope is from line of canal to river. As a general rule the land a short distance from river is not lower than that immediately adjoining river. After irrigation my water generally finds its way back into river. The lands irrigated by the Oasis canal extend at least two miles from river in some places. These are bottom lands and what we call second bottom. On land in Tp. 18, R. 74 there is a very good bottom, dark soil, sandy loam, good hay land, good alfalfa land and good for oats, rye and potatoes. It is devoted largely to native hay. At present oats are not very extensively raised in that vicinity. They have been raised to quite an  
593 extent, periodically, for the last 15 years for commercial purposes. Rye is raised more for forage and made into hay and used for pasture and not so much for commercial purposes. Potatoes are produced to a certain extent, but all these men use a good many potatoes and they raise them for their own use, but often more than they use. I would not call this a potato district like Greeley. In my statement of the amount of land under the Oasis canal I may have gone below the end of the canal in taking that last estimate. My estimate of 12,000 acres under the canal also included land irrigated by ditches next to the river and which had been previously irrigated by overflow. The major portion of the 12,000 acres under the Oasis canal is included in the Talmadge-Buntin project. There are about 1,000 acres under the canal not included in the project. These lands are principally in Sec. 24, Tp. 17, R. 24. They are called the R. E. Fitch place. I own them. I did not go into the Talmadge-Buntin project. I have no connection with that. I think the Oasis ditch irrigates some land to  
594 the east of its line by laterals. I understand that the James Lake Water District owns the Oasis canal at present. The Talmadge-Buntin funded bonds for building the James Lake reservoir and ditches and turned all of their holdings practically all of the indebtedness to their clients over to this water district. The Talmadge-Buntin people were original promoters of district. There is no Talmadge-Buntin irrigation district,—It was called the Laramie Valley Irrigation District at one time. The lightening changes here are shown by the Talmadge-Buntin. The two  
595 gentlemen came out here and bought about 60,000 acres of land of Mr. Haley and promoted a colonization scheme and when they got done all they wanted to do with it, they got out of it as nearly as they could, and the bondsmen, the people who put up the money to bond this reservoir and ditch business, were left holding the mortgages against the settlers. I don't think there is anything crooked or unreasonable or unbusiness like. When I

speaking of these lightening changes I don't mean to insinuate, but things have been changing so a part of the time and I attend to my own business, and I can't keep track of all these things. Mr. Talmadge I knew when he was here and understood he was a Chicago gentleman. Mr. Buntin is a Nashville, Tennessee gentleman. Both are nice gentlemen, perfect gentlemen, to all appearances and businessmen. Mr. Buntin is here in town now with his family and I think you would say that he is a nice gentleman as far as that goes.

I do not think that any of these lands are irrigated from the Pioneer canal. The Pioneer canal ends about a mile from the river. It ends in Sec. 18, Tp. 16, R. 75. It would be nearly a mile and a half from the river. I do not know whether it has been extended from that point in a northeasterly direction for probably 2 miles to a point at or near the river in Sec. 5.

596 There were probably 1200 acres of land between the Oasis canal and the Laramie river that water might be carried onto from the canal. I would think there were something like 6,000 acres of land actually irrigated from that canal now. A

597 small portion of the lands between the Oasis canal and the river are irrigated by the Boughton ditch. My estimate of land under the Oasis ditch would include, to a limited extent, the land under the Boughton ditch. That ditch belongs to a different company entirely and there is no way to appropriate that water out of this ditch for these particular lands. The Boughton ditch is owned by the Iron Mountain, a live stock or ranch company, whatever it is. Mr. Frank Bosler is the head and front of it. J. H. Boughton built the Boughton ditch. It was never intended to irrigate any of the Haley ranch, but to carry water from the river quite a distance and irrigate lands owned by this Iron Mountain Live Stock Company and the Diamond Cattle Company. These companies all belong to the same general owners. When Mr. Boughton built the ditch the company was the Iron Mountain Company. The Boughton ditch is below the point where the

Little Laramie joins the Big Laramie.

598 This ranch was a large tract, of some 60,000 acres of hay and grazing lands, owned ostensibly by the Haley Land and Live Stock Company, of which Mr. Haley was the whole works. It was a stock ranch devoted largely to cattle and quite largely to horses and to some extent to sheep. Half of it lay between the junction of the Little Laramie and the Big Laramie rivers. The Abbott ranch was acquired by this concern, and a large lot of railroad land on both sides of the river clear up to within 3 or 4 miles of Laramie was included in that whole proposition. Outside of that it was pretty largely grazing land, second bottom land. The land extended along the Little Laramie some little distance, but we have not been referring to that at all, but that was included in this tract of land. These lands along the bottom of the Little Laramie were also hay

599 lands. Mr. Haley got some cattle for the Marcus Town land in Sec. 2, Tp. 17, R. 74. The natural course of the water from the Oasis canal, after it has been used for irrigation, would be to the Laramie river.

After the land has been irrigated pretty successfully for 2 or 3 years it does not require as much water to irrigate it as when you first started to irrigate. The bottom lands along the river are similar to the bottom lands above Laramie, with the exception that the lands below Laramie are not as easily irrigated as those above, on account of the sluggishness of the stream. The soil of these lands below Laramie is a sandy loam, sometimes a very dark and deep soil.

600 Except since the Talmadge-Buntin people sold the Haley land, and the water district took charge of it, there was very little measuring of water from these ditches. The measurement of water on these bottom lands is not a strictly scientific proposition. On the lands above the Oasis canal and those irrigated from it, the primitive method still prevails largely. There is no measuring weir, at the head of the Oasis canal. They have a very well constructed and substantial dam, mostly of rock, placed in the river. It is rubble rock, piled in loosely,—flat stones, but not laid up in masonry,—round stones and all kinds. They went out into the hills and collected them. They are largely just piled in. There

is also woodwork construction connected with it of some  
601 character. It is a very substantial structure. The James

Lake Irrigation District has a board of trustees who control the canal, and they have a water superintendent, who has three or four assistants who parcel out water with considerable regularity and system under the Oasis canal.

The water commissioner never interfered with the use of water on those lands which are not irrigated from the Oasis canal. It might be done without my knowing it, but I usually hear my neighbors talk about those things.

602 The R. E. Fitch ranch in Sec. 24, Tp. 17, R. 74 is about 10 miles from Laramie. Referring to the soil of these bottom lands, some kind of rock, limestone, underlies the sandy loam when you get down far enough but I never prospected much. It varies quite a good deal, sometimes you will find gravel and in a very short distance down within the length of an ordinary fence post setting, sand and a rod from there you will find solid soil. The river bottoms in this district below Laramie would range from half a mile to two miles in width. More particularly the portion near the river was irrigated by the natural overflow. Not the whole of the bottom, as a rule. Some very high water might spread out and cover all of it now and then.

Z. E. SEVISON, a witness in behalf of the Complainant.

Direct examination by Mr. N. E. Corthell:

603 I have lived in Albany County since March, 1908. Am a Civil Engineer and County Surveyor of Albany County. I know the Oasis ditch and surveyed it in 1908. The aggregate number of irrigated lands underlying the ditch as ascertained by me on that survey was 9151 acres. Two small tracts of irrigated lands lying between the ditch and the river were not included in the sur-

vey. One of those tracts contains 120 acres, the other 180 acres, making 300 acres irrigated in addition to the total irrigated from the canal.

Cross-examination by Mr. Fred Farrar:

604 The amount irrigated from the Oasis ditch is 9,151 acres.

There are 300 acres which are not irrigated from the Oasis ditch. The Oasis ditch heads in Sec. 19, Tp. 17, R. 73. I do not know its dimensions. I estimated its capacity at 120 cubic feet per second by taking cross-sections every 200 feet nearly the entire length. I do not have the notes. They have been turned over to the Arnold Company of Chicago. Before coming to this country,

I lived at Cheyenne about 8 months. I have been engaged  
605 in engineering a little over 7 years. I graduated from University of Michigan in 1906 with degree of Civil Engineering.

I was in the engineering department of the Lake Shore Railroad at Cleveland, Ohio, from July 1906 to September 1907, in the resident engineer's office, maintenance of way and the construction department. I was in Cheyenne from September, 1907 until March, 1908. From Cheyenne I came to Laramie in 1908. I have been county surveyor of this county since January 1, 1913. From March 22, 1908, until September 1, 1909, I was resident engineer for the Arnold Company on all their work here, including the James Lakes project and the Lake Hattie project. From the first of September, 1909, to July 1, 1910, I was on other work for the Arnold Company in Denver and Montana. Since 1910 I have been in Laramie continuously. I had other experience in irrigation engineering.

606 In Colorado I was on the Standley Lake project for the Denver Reservoir Company. From September, 1909, until April, 1910, I was in charge of construction of the distribution system on the Standley Lake reservoir. In Montana I was in charge of all construction on the Conrad project at Valier. I do not know that the Arnold Company goes by any other name. It had charge of the engineering work on the James Lake system. It is an engineering firm. I do not think they had any interest in the James Lake project other than engineering. B. J. Arnold of Chicago is the head.

He has never been actively engaged since I have been connected with or worked for the company.  
607

Z. E. SEVISON.

Redirect examination by Mr. N. E. Corthell:

608 The total acreage under the Oasis Canal having water rights from the canal is 11,246.03. The discrepancy was caused because the total I gave yesterday was the land included in the Laramie Valley District instead of the total under the canal. The 11,246.03 includes all of the lands under the canal.



## 608 Cross-examination (cont'd).

By Mr. Fred Farrar:

I am unable to give in detail the lands irrigated under the Oasis canal. I have prepared a table. The Laramie Valley Irrigation District is a municipal irrigation district organized under the laws of Wyoming. It is what is popularly and commonly known as the Talmadge-Buntin district. It was promoted by Talmadge and Buntin. I made a survey under the Oasis canal in the period from March to July, 1908. I used a transit and a chain. That survey was not made with as much care as one later, but with ordinary transit methods, being the deflection angles, and the distances between hubs were measured with a chain, and ties were made to the section corner wherever the ditch line crossed the section line. My finding of 11,246.03 acres of irrigated land was the result of the second survey, made in 1910 under the direction of N. W. Scott. They were making a new map of the irrigation district and this survey was made to determine accurately the boundaries of the district, as formed by the Oasis ditch. It was also used by the land company in making deeds. It was the final description of right of way of ditch. In making this survey no level was used. No measurements of the relative heights of land included were made. The lands irrigated under last survey are correctly shown on those two blue print tabulations which I handed you. In some instances I have two figures, one above the other, in each square of the table, each square representing 40 acres. Some of these 40 acre tracts are described in two or more adjudications or permits from the state engineer. I

610 designated them by different permits or adjudications. Perhaps in one adjudication they are described 10 acres and in another 30 acres, making 40. The acreage along canal and river was necessarily taken from survey. In some cases the figures were taken entirely from permits and not from survey, if there was any question but that land was entirely irrigated from canal. It might be a mile from canal, down close to river. In making this survey we did not actually measure each tract. My tabulation is, in a measure, the result of an estimate. These lands lie between the canal and the river entirely. That is all the land irrigated from this canal. I think it is all the land between canal and river. We did not use a level. I would not say that every acre of that land is under irrigation. There are some places where there is some rough land, some hummocks or other small tracts that are not irrigated. That table does not represent just land that is being irrigated, but all land under canal having water rights.

I don't know how many acres are actually irrigated. It varies from season to season. I have seen some variation in the last few years. 11,246.03 acres is total amount of land under canal, and not necessarily the amount of land irrigated. Some of this land cannot be irrigated. There is a trace of an old ditch in Sections 11 and 12, Tp. 17, R. 74, on east side of river. I think that is the Abbott and Coleman ditch, called that at one time, and there are the Abbott and Coleman water rights. This ditch irrigated lands that are in-



cluded within my estimate of the total amount of land under the Oasis canal. I know the Boughton ditch. It heads in Sec. 18, Tp. 18, R. 74. It runs parallel to the Oasis ditch from its headgate for a distance of about 5 miles. It is between the Oasis ditch and the river. The lands under the Oasis ditch include lands between the Boughton ditch and the river. They are irrigated from the Oasis ditch. The laterals from the Oasis are carried across the Boughton ditch in flumes in two places, and there might be more. The strip of land, approximately 5 miles in length, between the Boughton ditch and the river, is from a quarter to a half a mile wide. I never saw any of that strip irrigated from the Boughton ditch. I don't think any of the lands in this strip are irrigated from that ditch. I never saw any so irrigated, and they have no water rights from it. I do not know whether 2,-  
614 094.03 acres of the land included within the total of 11,-  
246.03 acres, given as the total acreage, belong to the Laramie Valley Irrigation District or not. There is not that much excluded from the district. The figures 9,151 acres, in my direct examination, were intended to represent the land under the Oasis canal and within the boundaries of the district. That figure was only approximate and does not represent all the land so situated. There are two tracts of land containing 372.56 acres which are within the boundaries but do not form part of the district. I do not have their descriptions. I do not know number of acres under canal which are actually included within area and jurisdiction of the irrigation district. I can't give exact acreage within the district on the Oasis canal. There are lands under the canal not within boundaries of district. I know the Bilderback ditch. It heads in Sec. 29, Tp. 18, R. 74, and is approximately 3 miles long. It runs  
616 northeasterly nearly parallel to the river. It ends just about a mile due east from the head of the Boughton ditch. The lands under that ditch are included within the 11,246.03 acres. They are not irrigated from the Bilderback ditch, except as it is now used as a lateral for the Oasis. I think that is only use to which it is put. During last few years and since my acquaintance with it, it has not diverted water from river. This is not the Bilderback ditch situated south of Laramie. There were two  
617 adjudications for Bilderback ditches, but I don't know whether there are two ditches. This is only one I know. The 372.56 acres not a part of the district, are in Sections 24 and 4, Tp. 17, R. 74. Mr. Biddick owns the land in Sec. 4. I don't know who owns that in Sec. 24.

Z. E. SEVISON.

Redirect examination by Mr. John D. Clark:

618 I was engaged in this survey about two weeks during the irrigation season in 1908 and was there a short time at different times in 1910 prior to the irrigation season. Have been over that land every week or ten days or oftener during the past five irrigation seasons excepting parts of 1910. About 75% of the land

between the ditch and river is irrigated to wild hay, alfalfa, oats, potatoes, barley, wheat and various kinds of garden truck.

619 The total was as large in 1908 as at any subsequent time. I know Cooper Lake ditch. Made a topographical survey of the land under it. Ascertained the acreage of irrigated land under that ditch.

620 The survey was made the winter of 1908 and '09. The headgate is in Section 27, T. 19 N., R. 74. It diverts water from the Laramie. Runs northwesterly, irrigating 750 acres of land west of the river in 1908 and since.

Recross-examination by Mr. Fred Farrar:

620 The headgates of the Bilderback ditch and of the Boughton ditch are below the junction of the Little Laramie and the Big Laramie rivers. The lands formerly irrigated from the Bilderback ditch are now irrigated from the Oasis ditch. I only know where it takes water out of the Oasis at the present time. The headgate of the Oasis ditch is above the junction of the two rivers. It is supplied with water entirely from the Big Laramie river.

621 The old Bilderback ditch and the Boughton ditch were supplied with water from both the Big and the Little Laramie rivers.

Recross-examination by Mr. Delph E. Carpenter:

I made a topographical survey of the lands under the Cooper Lake ditch for the Arnold Company. They did not own this ditch. The survey was made in connection with a topographic survey of all land under this project, James Lake and canals, that is, all of the land west of the Big Laramie River. I made a complete topographic survey of all of the lands included in the Laramie Valley Irrigation district. This land under Cooper Lake ditch is a part of the district. In the general promotion of the Talmadge-Buntin project, or the Laramie Valley Irrigation District they took this ditch and its lands into the general scheme. I do not remember just how

622 many acres under the ditch were actually irrigated when I made the survey. There were 750 acres under the ditch. Prior to 1908, the land was all ordinary hay meadows. Perhaps 50 per cent of the 750 acres being included therein. Mr. Haley was using the meadow at that time. I did not ascertain how much hay he cut. The Laramie Valley Irrigation District owns the Cooper Lake ditch now. They obtained it when they took over the Oasis ditch when the district was formed in 1908 the Cooper Lake ditch was included in it. The Cooper Lake ditch has been used since 1908 directly from the river. I never made any measurement of the ditch.

623 It irrigates native hay river bottom land. The land was sold to settlers the same as a lot of other land there. I don't know who was the purchaser. There has been a man living on the Cooper Lake land and he bought most of the land that is under that ditch. That portion of the lands under the Oasis ditch above the

mouth of the Little Laramie and in Tp. 17, R. 74, is practically all wild hay lands, hay meadows. I do not know how much hay it produces per acre. I was there when hay was being cut on

624 Sections 1, 2, 3, 11, 12 and 13, Tp. 17, R. 74, also Sections 7 and 18, Tp. 17, R. 73. Practically all of section 1 under the canal is hay meadows. Nearly all of Sec. 2 that is under the canal and Sec. 11 and also Sec. 12 are hay meadows. Those meadows have changed hands several times during this period. Mr. Haley owned all of it in 1908. All of the land under the Oasis canal in that township is native hay land. There are a number of settlers with 80 or

625 160 acres in Tp. 18, R. 74 that are raising other crops besides hay. One of them, Mr. Dougherty, raises oats and alfalfa. Two years ago he had about 40 acres of oats and also potatoes. He had just a small patch of alfalfa in 1911. He lives on the land. Herman Luven is another settler. He had 40 acres of oats in 1911. I don't know what he had in 1912 or 1913. He lives at Vosler. I do not know how much his oats produced. Mr. Davis also lives there.

626 He had about 20 acres in crop in 1911, nearly all oats. I do not know what he obtained or what he had in 1912 or '13.

At one time there were quite a number of settlers west of the railroad in that township, some have moved away, and their buildings are idle. I did not make a plane table or topographic survey of that land lying east of the Union Pacific railroad and irrigated by the Oasis ditch. I did not classify it as to its fitness for agriculture. I do not know of any such survey being made. I do not know how many tons of hay were cut all told west of the Union

627 Pacific Railroad and under the Oasis canal in 1913. There was not very much hay cut in Tp. 13 and west of the Union Pacific Railroad in 1911. There was a good deal of land back of that. I think that was during the time they were changing around there a good deal and the meadows were neglected and some of them were broken up. The bulk of bottom lands are still the same as in 1908. I could not give the percentage of meadows that have been broken. I know how much irrigation has taken

628 place under the Oasis canal since 1908. I have never kept track of the settlers or their locations or of the amount of hay cut or anything of that sort. I haven't measured up the hay ground in all these seasons. Right along the river the land is barren. That is river bottom and it overflows. The land between the bench and the river is barren. There is a strip of land starting at the edge of the bench and going toward the ditch that is barren. About all of the land upon which there is native hay is over near the ditch, that follows along practically paralleling the ditch and as you get near the railroad it widens out and extends pretty well down to the Boughton ditch. Along in about Sec. 27, Tp. 18, R. 74 the hay land is about a half a mile wide. The hay land narrows down there probably by the time you get to the west line of Sec. 28. That is about the end of it. Between there and the river it is practically

629 grazing land. Further down on both sides of the railroad there have been some attempts at farming. Leaving out the Oasis and the Ghost place, under the entire Oasis ditch there

are 6 sets of farm buildings, including residences and outbuildings, not all occupied now. There was one good patch of alfalfa on the Ghost ranch in 1910, '11 and '12, about 20 acres in Sec. 35, Tp. 19, R. 74. I don't know anything about the production of that land. Portions under the Oasis canal showed evidence of seepage and alkali in places.

My experience has not been entirely limited to handling irrigation in the Laramie Valley, outside of some little work on the Denver Reservoir Irrigation Company's promotion. I have done considerable work in the Platte Valley over in Carbon county, in the Platte Valley in Wyoming, under quite similar conditions to those here. I did some work in northern Montana, near the town of Valier. The conditions were not the same there. I had charge of the construction of the Conrad and Valier project.

631 Recross-examination by Mr. Fred Farrar:

I made a topographic survey of the lands west of the river in this district. I used a transit in making this survey. My contour intervals were 5 feet. Talmadge and Buntin are commonly known as the promoters of the Laramie Valley Irrigation District project. The district is sometimes known as the Talmadge-Buntin project. It is also known as the James Lake system. James Lake is a reservoir that supplies a portion of the system. It receives its water from the Little Laramie and other creeks, but no water from the Big Laramie river. Water from James Lake as applied to land in this district is not water which is taken out of the Big Laramie. The lands under the Oasis canal get no water from James Lake. Those lands are on the opposite side of the river from James Lake.

The capacity of James Lake is 41,100 acre feet. It has a storage depth of 30 feet and an area of about 1400 acres at the upper high water line. It has as other sources than the Little Laramie, the Four Mile creek, Seven Mile creek, and the Mill creek. The dam and outlet, the structure which regulates water taken from reservoir, were constructed in 1908 and '9. In 1912 there was a change in the dam and outlet. The two gates were cut out entirely and closed up and one of the structures changed from an overflow to a sluice gate. Two steel sluice gates were installed and these passages were arched over and filled in with earth. The only reason for these changes that I know of is that the Government asked to have them made before they approved this system. The original concrete work was rather

badly cracked in places. The outlet ditch from James Lake was constructed in 1908 and the spring of 1909. The main outlet is 4000 feet to the bifurcation works. Then the main canal divides into the north canal and the south canal. These were constructed at the same time as the main outlet and were completed in July, 1909. The north canal is 32 miles in length and the south canal 9 miles. They were completed at the same time. The outlet ditch has a capacity of 300 cubic feet per second. The north canal ends near the west line of Sec. 34, Tp. 19, R. 75. The south canal ends near the northwest quarter of Sec. 14, Tp. 17, R. 75. At the

head the south canal has a capacity of 90 cubic feet per second and the north one has a capacity of 250 cubic feet per second. Four Mile creek is now diverted into the reservoir, and there is no water taken out of Four Mile creek below where the north canal crosses the old Four Mile creek channel. The ditch is constructed across the old creek channel and a dyke constructed in the old creek bed on the lower side of the canal.

The feeder ditch into James Lake was really completed in 1911. There was enough of it completed so water was turned into the reservoir and it was used as a supply canal in 1909. That original construction was not for its whole length. It utilized the old Bellamy canal for a distance of between 16 and 17 miles. The Bellamy canal lead out of the Little Laramie river. It had previously been used for the irrigation of lands along the Little Laramie.

The first water for purpose of irrigation was stored in James Lake during the season of 1909. Approximately 18,000 acre feet were stored and a small amount used that year. Including the

635 balance which was carried over, I would say that there were about 10,000 acre feet stored in 1910. 8,000 acre feet was not used in 1909, counting the seepage and evaporation there was more than that used. There was not 10,000 acre feet carried over. The reservoir was practically dry at the end of the season of 1910. During that year all the water except that lost by evaporation and seepage was run through the ditches and laterals. Some of the settlers used it, those who had land under it. It was all applied to lands. In 1911 about the same amount was stored as in 1910. Not more than 10,000 acre feet. All of it was used for irrigation that year. About 22,000 acre feet was stored in 1912. It was not all used but about

636 18,000 acre feet were carried over. During the summer of 1912 the district was repairing the dam. The season of 1913 was commenced with about 18,000 acre feet in the reservoir.

I do not know what has been stored this year, 1913. Early in March the water on the dam indicated about 21,000 acre feet from the depth of the water. The greatest supply of water is obtained in June. In 1913 they had about 21,000 acre feet of water in the reservoir with the high water yet to come. 22 feet in depth at the outlet tube would amount to 21,000 acre feet on storage. I have no information as to the amount in the reservoir subsequent to 1913.

637 I know the Loback ditch. The Bellamy ditch is an auxiliary supply for the Loback. The Loback is further west. It heads on the north fork of the Little Laramie. The Loback and the Bellamy ditches join in Sec. 12, Tp. 16, R. 67. From that point on they are one ditch.

From the Little Laramie river to Mill creek the Lake James Supply ditch has a capacity of 400 cubic feet per second. From Mill creek to the headgate of the Blackburn ditch it has a capacity of 550 second feet. From the Blackburn headgate to Seven Mile creek it has a capacity of 400 cubic feet per second. We utilize the channel of Seven Mile creek for two and a fourth miles above James Lake as a feeder ditch. The water from Four Mile creek is diverted into the lake on the other side from where the Seven Mile creek enters.



The lake is built in the channel of Seven Mile creek, which simply flows into the lake. The outlet structure is built into the lowest point of the arm of the lake. It don't overflow there if it ever  
638 overflows. My topographic survey was all on the west side of the river in this district. I could not say what percentage of the land is too high for irrigation.

The original surveys on James Lake were started March 22, 1908. The original surveys on the north and south canals were started within the next 5 days. The original survey of the feeder or supply ditch was started on March 22. The reservoir survey was started 2 or 3 days later.

The Bellamy canal was originally enlarged all the way from the Little Laramie river. The Loback canal is not used as a feeder for the reservoir. The enlargement was rather irregular. It was 8 feet on the bottom and carried 2 feet of water. The enlargement for the Little Laramie to Mill creek is 14 feet on the bottom and carries 4½ feet of water. From Mill creek to Blackburn headgate it is 18 feet on the bottom and carries 4.8 feet of water. From the Blackburn headgate to Seven Mile creek it was 22 feet on the bottom  
639 and carried about 3 feet of water. I assisted in making these original surveys. No water that is taken through the Loback canal is carried into James Lake. Prior to the enlargement of the Bellamy canal the Loback canal was used, but since that was completed the Loback has been used very little, if any. It was not the original design to use the Loback canal as a feeder for the reservoir. It is available as a feeder, however. The Loback canal heads on the north fork of the Little Laramie river. I do not have the topographic map which I made of this ditch. The original is in the office of the Arnold Company. I don't believe there are any copies here in Laramie.

LARAMIE, WYOMING, September 3, 1913.

Cross-examination by Mr. Fred Farrar:

640 I do not have the records showing the capacities at the various contours on James Lake reservoir. There should be one in the state engineer's office. I filed such a statement or tabulation. I have never worked directly for the district. Mr. W. H. Tuller has charge of the irrigation works for the district. He has charge of the distribution of water for the Carey Act land and for the district also. He lives at Bosler. There is an election held in the district every year.

Z. E. SEVISON.

Redirect examination by Mr. John D. Clark:

641 The Talmadge-Buntin lands lie on both sides of the Laramie. The lands on the east side aggregate about 11,000 acres under the Oasis Canal. About 75% of those were irrigated prior to the Talmadge-Buntin Project and the balance under the



Oasis Canal are included in the projected scheme and are in the Laramie Valley irrigation district.

642 The Big Laramie supplies water for these lands, James Lake Project has nothing to do with them. The Cooper Lake Ditch is a part of the present Talmadge-Buntin Project. The lands under that ditch are irrigated principally from it, but it was also planned to furnish some water through an auxiliary supply from the North Canal of the James Lake system. The Big Laramie supplies Cooper Lake ditch. There are still other lands on the west side of the Laramie in the Talmadge-Buntin Project and also in the Laramie Valley irrigation district.

643 There are also Carey Act lands on the west side secured by the State of Wyoming for reclamation under canals constructed by the Talmadge-Buntin Project. There are about 30,735.92 in the Talmadge-Buntin contract on the west side of the river including 750 acres lying under the Cooper ditch and also including Carey Act Land and Municipal irrigation district land. About 9500 acres are Carey Act lands and west of the district 3577 acres additional to Carey Act lands not included in the district. The district lands west of the river are about 18,000 acres. The main tract of 30,000 acres is susceptible of irrigation from the irrigation system that is constructed. This system is completed.

644 James Lake Reservoir supplies these lands west of the Laramie River outside of those supplied by Cooper Lake ditch. Lands lying on the west side not under the Cooper Lake ditch have been irrigated since the construction of the system, principally by settlers who commenced to occupy the lands in the spring of 1909. A few new settlers have been coming in every year and others moving away and shifting around. The entire area has not been settled up.

Recross-examination by Mr. Delph E. Carpenter:

This is the first that I know of the news ever being published that the patents have been issued. I could not tell the number of settlers that we had on the project in 1909. I should say that in 1912 they had about half as many settlers as they did in 1909. I am not so familiar with it this year as to the actual number of settlers and the lands they are irrigating.

645 Recross-examination by Mr. Fred Farrar:

This is the first year that I have known of a report being published to the effect that the patents were issued. One protest has been made against the issuance of patents before, by a number of settlers. I think that was sometime during 1910 or the early part of 1911.

Redirect examination by Mr. Corthell:

645 I assisted in laying out the work of the Lake Hattie irrigation system, now owned by the Laramie Water Company.

646 Began the work April 16, 1908; surveyed first Lake Hattie Reservoir, then the intake canal from the Laramie River,

also preliminary surveys for outlet canals and distribution system. These surveys continued with slight interruptions for a little over a year. The final location of the canals was started about May 1, 1909. Surveying parties were continuously employed. Actual construction work was started July 17, 1909. The contract was let June 14, 1909. Two drag line machines were at work on the construction, about 35 teams on the dam and 150 teams on the north canal and 75 teams on the south canal.

647 The machines worked double shift, about 1800 yards of excavation per day for each machine. The capacity of Lake Hattie reservoir is about 60,000 acre feet. I surveyed the Boswell reservoir, later called Roberts-McConnell reservoir, June 1, 1908. The dam is at the upper end of the cañon about a mile north of the state line between Wyoming and Colorado. That was to

648 be a part of the Lake Hattie System. All these works were to draw water from the Laramie River. When I returned to Laramie in July, 1910, the Pioneer Enlargment was completed; Lake Hattie Supply Canal No. 1 was completed to within 2000 feet of Lake Hattie, the earth work on the dam was finished, the main outlet canal completed to the bifurcation, the North Canal completed, except the bridges and a few small patches of earth work left for road crossings, as far as a point directly west of Laramie; the South Canal was completed almost to the Big Laramie River except bridges. Since, the dam has been finished, concrete facing put on, the intake canal finished, the dam in the Big Laramie at the head of Pioneer Enlargement re-built, the bifurcation of the North and South Canals finished, the bridges put in, turnouts for the laterals or lateral headgates completed. Lake Hattie Supply Canal No. 2 had been built from the Little Laramie and the dam built in the Little Laramie.

649 The system is in operation since early in 1912; the intake canal to its full capacity since 1912, North Canal in operation for about two months. They stored a small amount of water in Lake Hattie Reservoir in 1911; considerable in 1912; no water has been flowing into the reservoir so far as I know in 1913. The intake canal from Sodergreen Lake to the reservoir has a capacity of 1000 second feet, the outlet canal of 700 second feet. The first filings on land lying under the canals called for 60,000 acres. The system takes its water from the Laramie River and the return flow goes into the Laramie.

650 In making the survey for the Lake Hattie Supply Canal, I found stakes of previous surveys, following very closely the line of my survey. 100 to 200 feet apart was the greatest variation. It was designed to irrigate practically the same land and the water to be taken from the same source.

650 Cross-examination by Mr. Delph E. Carpenter:

At the time I began these surveys on April 16, 1908, I was working for the Arnold Engineering Company. Mr. Rosecrans directed me to start. He was chief engineer for the Arnold Com-

pany. I was in Laramie when I received the order where  
651 I have been since March, 1908. This project was surveyed  
by the same field parties that surveyed James Lake. We  
shifted back and forth from one project to another. This preliminary work was under my immediate supervision. I know a man by the name of G. I. Speer. He was from Chicago. He had something to do with the financial part of the project. The Arnold Engineering Company were doing this work up to about the first of June, 1908, for Trowbridge and Niver, of Chicago. I do not think the Arnold Company is a promoting company as well as an engineer company.

I ran three preliminary lines from the Pioneer headgate to Lake Hattie. One followed the Pioneer itself to the Sodergreen  
652 lake and then followed the line of the present supply canal No. 1 to the reservoir. Another one started at a point so as to follow what was known as the old Collins ditch and a little bit higher up than the Pioneer. The third one was still higher up so as to be independent of the other ditches as much as possible. The last one headed on the river just about Lund's ranch. I found the first line to be the most natural and feasible line. Good engineering dictated that it would be the most economical to build, provided satisfactory arrangements could be made for the use of the Pioneer to Sodergreen Lake. This line was finally adopted. In surveying these lines I considered the question of economy of construction as well as the mere location of the line itself.

The first survey was made at the reservoir site to see if it was feasible. By constructing a dam at its present location we  
653 could make a reservoir there. The final contour map showed about 15,000 acre feet of dead water, that is waster that you cannot draw off, in the reservoir. We made a cut so as to let off water that would otherwise have been detained in the natural old original lake basin. After drawing off all of the water possible by way of the outlet, there would be about 15,000 acre feet of dead water. I do not know how deep, as we did not make any soundings as to depth in this dead water area. I simply ran the contours, starting with the lower or zero contour at the elevation we could draw water from the lake, and ran from that up. These contours were run at two foot laterals. I did not reduce these surveys to the form of a map. That survey was in progress when I left, making a careful contour survey of the reservoir site, but I have seen the map. My work was largely preliminary work on the Lake Hattie reservoir, work that is usual on any project of any size. My time  
654 was taken up with that instead of final contouring and similar work. I estimated at that time that there were 60,000 acre feet of storage capacity available for use from the reservoir. The final maps were filed with the state engineer of Wyoming. They should show just what the capacity is.

After I had worked on the reservoir I went over to work on the inlet canal, being the canal from the Big Laramie river to the reservoir. I moved my party over to go to work on the inlet ditch a

week afterwards. I was 4 days in locating the lower or final line as the feasible one. The country between Lake Hattie and the river is very easily surveyed. Most of it is across a table land that is quite uniform. There is a little brush on the river, but away from the river there are no trees or brush to interfere. The ditch follows the line which would be run by a level. There is no tunneling or heavy cutting with but the one exception where you go through the arin of the bluff. There are no railroads or mines, or any-

655 thing of that kind to conflict. I had an unlimited field in which to work, without any obstacles. There was only — place at the southwest of Lake Hattie that had a small irrigating ditch through which we ran. There was only a very little rock work, close to the lake. The line was afterwards changed so finally there was no rock work at all on the new ditch. The lower end of the inlet ditch was very readily and economically constructed by the use of water running down into the channel rapidly and eroding into the ground. Last 200 feet was so constructed. I do not remember the yardage in so excavated between the river and the upper end of the Lake Hattie inlet ditch. It was all done with a drag line. Approximately, the price paid for that drag line work to the sub-

656 contractor was 13 cents per cubic yard. I did not classify any of that work. The Pioneer canal was finally enlarged to have a capacity of 1200 cubic feet per second. The old capacity was about 300 cubic feet per second. That portion of the old Pioneer canal south and west of the Sodergreen reservoir, about half a mile in length, was re-located. The other portions followed the old Pioneer very closely. The old Pioneer was straightened out in places and given a little better alignment. It was made larger by widening it on the upper side and excavating into the upper side of the embankment. The old or lower embankment was left in place. The capacity was increased by using the material so borrowed from the upper side for the purpose of raising the lower embankment. It was planned to carry a certain amount

657 of water against the lower embankment made from material excavated within the prism of the canal. In relocating the Pioneer we cut out the old bend and straightened the channel by going straight across from about the center of Sec. 29 to the lake. This involved a cut right at the point of departure from the old canal through a little hog-back. That work was done with the drag line. From the Sodergreen Lake on down to the reservoir the ditch was made with a drag line, excepting that particular portion cut out by the use of water. In the drag line work the dirt was deposited on both the upper and lower sides of the ditch. That portion of the ditch was made by simply cutting down across an almost flat table land.

The dam at Lake Hattie was made from earth borrowed in the vicinity of the structure. It has a reinforced concrete facing. The maximum height of the dam was 36 feet, called for by the

658 first plan, afterwards increased. At point of maximum height fill did not include any of the old natural embankment because there was none at that time. The preliminary estimate and

figures on yardage on which contractor took contract for dam was 180,000 cubic yards. The general contract price was 26 cents. Do not know what the sub-contractors obtained and do not remember the yardage in the outlet work and the outlet canal, the north and south canals. I have not figures,—they should be in possession of the Laramie Water Company.

The final location and line was made in May, 1909. At that time I staked out all these final lines. I did not include  
659 the lands under the Pioneer canal in the 60,000 acres to be irrigated from this system. The lands to be irrigated from the Lake Hattie reservoir were between the Pioneer canal and the north canal, the bulk being between the Little Laramie and the Big Laramie rivers, in Tp. 17, R. 74. There were also about 14,000 acres south of the Big Laramie river, which was proposed to irrigate from the south canal after crossing the river. That was situate over north and east and some west of Creighton and Hutton Lakes. This irrigation of the land east of the river was never finally developed. The south canal was constructed only to the Big Laramie river. The north canal was constructed around to about the center of Tp. 16, R. 74, and completed in 1912, the main canal. All work on the main outlet canal, and on the north and south canals, was the  
660 ordinary small ditch building,—entirely plain earthwork, no tunnels or rock work or flumes or anything of that sort. The whole Lake Hattie System was one of remarkably small cost and economical construction. At no place in the entire system did we encounter any difficult engineering problems. They also intended to irrigate about 12,000 acres in the Big Hollow with water of Lake Hattie. Nothing was ever done toward the construction of those laterals. We got into Big Hollow with rather a deep cut. The High Line of course—the ditches from Lake Hattie were rather low down in the Big Hollow—and the High Line was to irrigate practically on the north of the Big Hollow, follow the ridge to the north.

The High Line canal could not draw water from the Lake Hattie Reservoir but it could from the Boswell or the Robertson—McConnell reservoir. I do not know by whom those old stakes on the High Line, which Mr. Corthell mentioned, were placed. Judging from their condition they were pretty well weatherbeaten, I should say they were ten years old anyway. They were indicative of an old survey having been run before.

661 It is nothing unusual to find stakes of old surveys in running lines. This was the natural and most feasible line for the continuation of the lateral or High Line from the Pioneer canal. No old maps were given me that I followed and no old surveys. Until I ran onto those stakes I didn't know there had been a survey run there. I would think that these stakes had evidently been placed on some preliminary line run from the Pioneer canal in the neighborhood of Sodergreen Lake. They would indicate a grade line run from Sodergreen lake.

It was not a part of the original plan to take the Pioneer canal as well as the land under that ditch. That was brought about some-



time during the latter part of 1908 or early part of 1909. There had been a union of the two enterprises just before the actual construction work was started. I met Mr. Wendelkin and Mr. F. C. Grable in 1908. They were not interested in the promotion of the Lake Hattie, but were interested in the Stewart project. The two projects overlapped to a certain extent. As to their subsequent  
 662 connection with this enterprise, I don't think they were vitally interested in the project until after the construction work was actually started on the Lake Hattie project. I ran across these old stakes on the High Line about every 300 to 800 feet. I should say that they were indicative of a fly line survey or preliminary survey. They certainly were not final location stakes.

It was not a part of the original plan to construct a series of laterals in townships 16 and 17, R. 74. That was a later arrangement on the part of Mr. Goldsborough. They have not been constructed and I don't know how much has been done, as I have not been out there this summer. The work on that portion of the Lake Hattie project was discontinued recently.

663 No construction work was ever done on the High Line from Lake Hattie after I left. There were other surveys made later in the nature of a final location survey. I had nothing to do with that. No work was done on the south side of the Laramie river. The location of the dam of the Robertson and McConnell reservoir was across the bed of the Laramie river at the upper end of the canon. The water would have been backed up in the river valley had the dam been constructed. The work of construction has never commenced on it, other than a mere survey.

There might have been water run into Lake Hattie reservoir during the fall of 1911 and during 1913, particularly the spring or early months. A great deal of the water which flows off from the irrigated fields or away from the ditches, other than onto the  
 664 land up under the Pioneer canal and under the north canal, down pretty well toward Laramie City, flows into numerous ponds or natural lake basins. It eventually goes away by evaporation. The return flow from this system into the Laramie river results from the irrigation of lands in townships 16 and 17, R. 74. It does not include that portion which runs into numerous lakes under the Pioneer system and evaporates.

#### Cross-examination by Mr. Fred Farrar:

This Stewart project combined with the Lake Hattie project. Lake Hattie reservoir derives its water supply from other sources besides the Big Laramie river. There is a supply canal built from the Little Laramie river. There are also two little creeks which flow directly into Lake Hattie. They are very small torrential streams,—flood water streams—dry in the summer time, as a rule. They drain a small water shed into the west or north of Lake Hattie, the easterly slope of Sheep mountain. The obtaining of water supply from  
 665 Douglas creek was a part of the Stewart project. It is intended as a part of the water supply for this reservoir. Con-



struction work has been started on a diversion canal from Douglas creek. The creek coming into Lake Hattie from the west is called Johns creek, and is the only one of any size. The work I did in connection with the Arnold Company was done for Trowbridge and Niver. The Lake Hattie Reservoir and Irrigation Company succeeded them. They were succeeded by the Laramie Water Company. Mr. George Robertson of Shamokin, Pennsylvania, was at the head of the Lake Hattie Reservoir and Irrigation Company. Senator McConnell of Shamokin was also interested in the company. The High Line canal from the Pioneer to Sodergreen lake for which I made a preliminary survey, was never constructed.

666 The Big Hollow takes in the north half of Tp. 15 N., R. 75 W., about 3 sections in the northwest corner of Tp. 15, R. 74 and about 3 sections in the southwest corner of Tp. 16, R. 74. It is about 11 miles long and averages about  $2\frac{1}{2}$  miles wide. The depth would average about 150 feet at the bottom below the surrounding country. It is a great hollow lying in the center of the Laramie Plains, between the Little Laramie and the Big Laramie rivers. There is no outlet of any kind. It has no seepage water in it now. There is a small pond there in the bottom. There have been two or three ponds of considerable area at various times. I have seen more than one there in other years besides this. Any

water which gets into the Big Hollow must either evaporate  
667 or pass away by seepage through the soil if it gets out. The 12,000 acres in the Big Hollow which it was expected to irrigate with this system and 14,000 acres on the south side of the river, forms a part of the 60,000 acres, but the project is not completed to irrigate either of these tracts. It is very doubtful if any of the waters would ever circulate away from the Big Hollow. If it should so percolate it would be in an easterly direction toward the Big Laramie river. I do not know the number of acres in this project that are now under cultivation or irrigation.

No work on construction of The Robertson-McConnell reservoir was done that I know of. The dam site of that reservoir was in Wyoming, nearly two miles north of the Colorado Wyoming state line, right at the mouth of the canon where the river enters.

668 Cross-examination (cont'd).

By Mr. Delph E. Carpenter:

All of the water which runs into the Big Hollow now from natural drainage from the area within the hollow settles down into those lakes at the bottom. It remains there until it evaporates. If the slopes of this hollow were irrigated all water settling into the bottom of the hollow would have to evaporate. The consequence would be that the lower part or bottom of the Big Hollow, and particularly the large flat in the bottom, would eventually become wet seepage lands, covered more or less with water and alkali. The only land which would be fit for cultivation would be that which would remain on the slopes of the hollow. That land has a slope of about 150 feet to the mile. I would consider it pretty steep for successful irrigation.

J. T. DODGE, a witness in behalf of the Complainant.

Direct examination by Mr. N. E. Corthell:

669 I have been living in the vicinity of Section 34, T. 23, R. 73, since 1893. Engaged all that time in ranching. I irrigate 120 acres of land from the Laramie River through the Dodge ditch and 93 acres through the south side ditch. The Dodge ditch was built in 1894, the south side ditch in 1906. Have irrigated these lands ever since. Grow alfalfa, wild hay, potatoes, vegetables and some small fruits.

670 Cross-examination by Mr. Fred Farrar:

I am below the reservoir known as the Wheatland reservoir No. 2, possibly 10 miles by the river. I am about 12 miles above the diversion dam of the Wheatland system by the meander of the river. I am about midway between the dam of the reservoir and the diversion dam at the tunnel. These lands in Sec. 34, Tp. 23, R. 73, are irrigated. They lie parallel with the river and are mostly bottom land. The altitude of my place at my northwest corner is 7,001 feet. Where I irrigate it would be about 6800 feet. The river bottom lands average at my place from a quarter of a mile down to 100 yards wide under the ditches. I am just above the cañon of the river. I have unirrigated land that runs right to the head of the cañon, possibly half a mile from where I irrigate. I am immediately at the head or mouth, that is the upper end, of the cañon. The river runs in a northeasterly direction from my place. After it passes my place its general line is easterly. Immediately to the north of the land which I irrigate the land is just rough, rolling land. After you get off of the river bottom, probably 100 feet, the land would be rolling from there on north. A mountainous country east. This Black Hill range is east of that. It would be called the Black Hill range north to Laramie Peak. The country to the north of me is not all mountainous. The north  
672 Laramie and other streams head to the north of me.

The North Side derives its water from the Laramie River. It gets the water out of the Big Springs. The north side ditch is the Dage ditch. I have a water right in the Big Spring, and the South Side ditch is from the river. I led water from the Spring run into the river and take it out at the dam. These Big Springs are about half a mile up the river from my section line. They are about 75 yards from the river. There are 7 of them and run 4 cubic feet of water per second. I have a ditch below the springs in the river and also a ditch from the springs past the dam. I can take water either way. The water commissioner stated that if I wished I could let the water run into the river and use the river as a canal the same as the Development Company. Both of these ditches use the same

673 dam. It is a rock dam with cribs, probably 200 feet long and its width at the base is 25 feet. The water from the springs reaches the river above the dam. I can use the water of the springs through the north side ditch or let it run down into the river and

take it out at the dam. It irrigates the same as the north side ditch. The south side ditch was designed to take river water. The north ditch is 6 feet wide on the bottom, 1 foot deep, and has a grade of  $3\frac{1}{2}$  feet to the mile. Both ditches are of that grade. It is  $2\frac{3}{4}$  miles long. The south ditch is of about the same dimensions and grade. The slope on each side is from the ditches to the river. The water is taken as much as a quarter of a mile in some places from the river. These lands are not natural hay lands. By wagon road I am 40 miles from Wheatland and 47 miles from Laramie. My nearest railroad station is Rock River, 28 miles. I actually irrigate 218 acres. 200 acres of that land is native hay. 13 acres is in alfalfa. I have one acre of potatoes this year. I have raised as high as 5 or 6 acres. I have a family garden. The water from these springs would naturally flow into the Laramie river. I have cattle and horses and run from 300 to 400 cattle. The country to the north, to the south and to the west of me is open range. To the east of me is the mountain range through which the river runs. About all the water is taken up. My cattle range in around the Blue Grass and Laramie Plains. The Blue Grass is to the southeast of me. By the Laramie Plains I mean the country south and west of me. My ranch is right on the edge of the Laramie Plains. My son and I run probably 30 head of horses. In the winter I keep my stock in the fields and feed hay when needed. We cut from 100 to 125 tons of hay on this 200 acres, it will average about half a ton to the acre. Part of that is new land and there was nothing on it when I started. It takes some time to make wild hay.

I think that a fair average would be about  $\frac{3}{4}$  of a ton to the acre on the irrigated. We don't raise any other crops except for our own use.

The authorities never have regulated the amount of water I am permitted to take. We take what water when and in amount needed. I commence irrigating about the first of May and irrigate until July 1st. Sometimes the alfalfa, the little I have got, I irrigate later for a second crop. We make two cuttings of alfalfa. They are cut about the first week in July and about the last week in August. We irrigate wild hay the first of May. We irrigate alfalfa along about May 15, if the weather has warmed up a little.

My north side ditch comes out at the springs on the west side of the river. In order to get to Wheatland I cross the Black Hills. Not many settlers in my vicinity. Mostly open country there. East of me are quite a few little ranches.

#### Cross-examination by Mr. Delph E. Carpenter:

I have no gate in the dam to let the water down the river. I have headgates in my ditches is all. The water goes over and through my dam. I intended to appropriate the water of these springs for my north ditch. I don't believe I require the full 4 cubic feet per second. I have no appropriation out of the springs for the south side ditch. Both ditches and the place belong to my wife.

I raise my headgate and let in what water the ditch will carry

and use it. Let the water flow over the land and it all runs back into the river. I like lots of water. There is some water in the  
680 river all the time, not enough to supply my wants if the springs were not there. The bulk of the water that comes through my place in the winter is through these springs. They shut their headgates down above. Those springs rise on Sections 32 and 33, 33 belongs to the Two-Bar. I settled there about 1892.

I took out my ditch on the north side in 1894. My object  
681 was to utilize the water from the springs for my land. The water commissioner measured my land irrigated from the north ditch and found there are 120 acres. The south side ditch was taken out in 1906, and finished in 1906 or '7. We irri-  
682 gate about 93 acres from that ditch. No one has ever disputed our right to the water. We simply take what we want to irrigate our land. We get through with that meadow irrigation about July 1. We then let our hay meadows dry so that we can cut them. That finishes our hay irrigation except for alfalfa.  
683 I sometimes later irrigate for a second cutting.

During the summer we run our livestock on the public range. In the winter on our own land. We generally have a round-up about the 15th of September and gather all the livestock and put them into the fields. My son and I have probably 2,000 acres of deeded land under fence. I suppose we had a section more inside, than we owned one time, before we tore the fence down. My son is T. B. Dodge. We run from 300 to 400 head. It is our custom to run these cattle on the range until the round-up.  
684 We follow the same custom as do the other stockmen. This pasture land runs into the hills. Some years we ship considerable cattle and some years we don't. When the market is right we aim to dispose of our steer crop every fall. Our calf crop as a rule does not equal more than 50 per cent of the number of  
685 cows. We usually care for from 50 to 75 calves in our weaning pens. We carry the cows and the rest of the stock in our fields during the winter time, feeding in time of storms. We do not always have sufficient hay to carry that number of cattle. We bought hay two or three winters. We had from 125 to 130 tons of hay the summer before last. That included our alfalfa.

686 With the feed we have in the fields, in the average winter our hay that we obtain from our place will carry us comfortably through. By saving this grass that grows on the 2,000 acres of pasture and putting that with our hay we are able to carry the cattle through. We run about 30 head of horses, we keep them on the open range in the summer. They are better able to shift for themselves in the winter than are the cattle. The loco weed bothers us in our country. We used to raise horses more than we do, but we cut down on account of loco and wolving. Wolves kill a good many colts. They seem to be very fond of colts. Between the loco and the wolves our horse industry is not profitable. I am not in the sheep business. These 30 head of horses we carry over from one year to another include all of our horses, large, small, saddle horses and work horses. We keep about 10 head of saddle horses on hand to

handle our live stock. We keep 10 or 12 work horses. We never work any saddle horses. There is no ranch between me and the dam of the Wheatland tunnel at the cañon. My ditches are the last ones down the river before the river enters the cañon. The only ranch between me and the Wheatland reservoir is McGill's. That belongs to Senator McGill. He has his private ditch near the dam at the reservoir. Other than his ditch and these two ditches of mine there are no other ditches between Wheatland reservoir No. 2 and the head of the cañon. We have the only ranches on the river between those points. The range country is all open south of my place and over towards the head of the Blue Grass and east of the reservoir. The country at the head of the Blue Grass is very good summer range country.

688 We turn our stock out in the spring about May 15. We have a live stock association in that country and have large round-ups. From 15 to 20 riders follow the round-up wagons. The Diamond Cattle Company have a representative on our wagon and we have a representative on theirs. The range over which our association works extends to the Union Pacific Railroad, about 28 miles, to Rock River and through there and clear in through north of Medicine Bow and Sheep Creek. It runs south up to Lake Lone. North up to the Sheep creek country, about 40 or 45 miles. The members of the livestock association turn their stock loose on this general range. This round-up lasts about a month in the fall. Senator McGill has the largest holding of cattle in the association. Our holdings are smaller than most of them. My business is primarily cattle business. We raise feed to carry our stock in winter and garden produce and potatoes to feed our family and men.

Redirect examination by Mr. N. E. Corthell:

When there is considerable water in the river it backs up over those springs.

Recross-examination by Mr. Delph E. Carpenter.

691 There are no other springs in the vicinity of my place than these Big Springs. There may be some little springs coming into the river between my place and the cañon. There are one or two little creeks between my place and the tunnel dam. That is a little stream made out of springs. The creek would not average over two feet wide. The water flows about six inches deep. It is a continuous creek, never dry. The stock water all along its way. Through the Black Hills are quite a number of springs. Take it east of my place through the hills there are a few springs. They are small and in dry years a good many of them go dry. The Sybille springs are south of me, on the west side of the Black Hill range and their water runs into the Sybille. The stream flows through the range over to the east side. There are some springs along the Blue Grass. There are springs on the north Laramie and those streams. Then there is Bear creek, way north, but that runs into the North Laramie below Laramie creek. These Big



Springs of mine are the largest springs in the community. They are larger than the Sybille springs. Their size gave them the name "Big Springs." I do not know of any springs up the river between me and the reservoir dam. Other than the McGill ranch there are no ranches between me and Gillespie's at Lake Lone. There is the Two-Bar shearing pens, I don't know that you would call that a ranch. I don't think they irrigate any. There is no ranch between there and Gillespie's. The next large ranch above Gillespie's is the Bosler ranch. The Diamond Company owns it now. Their ranch I think is right there near Bosler station.

694 From Bosler station down to my place the ranches of note are the Diamond place, the Gillespie ranch and the McGill ranch. It is about 26 miles by wagon road from my place to the Diamond ranch buildings. On Gillespie's ranch I think they irrigate some hay. McGill's is the only other hay irrigated between there and my place. The country through there is open range, except for McGill's and Gillespie's places. The stock range back and forth across the river between these places. We do not pass any houses on the wagon road between my place and the Diamond ranch, only McGill's on one road, and there are some buildings on the reservoir dam that you pass on the other road. Between Laramie City and my ranch I don't pass any houses along the road except McGill's ranch.

THOMAS B. DODGE, a witness on behalf of the Complainant.

Direct examination by Mr. N. E. Corthell:

695 I live near McGill Post Office. Have engaged in the ranch business all my life in Albany County on the Big Laramie. I know the Cramer ditch taking water from the Laramie River. Three people irrigate from the ditch.

696 On the Cramer ranch 80 acres are irrigated and he has another place near the end of the ditch. He raises alfalfa. That has continued 10 or 12 years. The ditch was built 12 to 15 years ago. The land has been irrigated all the time. Should judge Mertz irrigates 100 acres from that ditch, possibly more. He irrigated it for 10 years. He has two reservoirs.

697 He raises alfalfa and some small grain. All the water comes from the Laramie. Bonkey irrigates about 40 acres from that ditch. The ditch comes out of the range of hills at the east end or lower end of the Laramie River cañon 12 miles below the Wyoming Development Company's tunnel.

Cross-examination by Mr. Delph E. Carpenter:

That is the first ditch taking water from the Laramie river east of the mountains. It takes water from the north side. The ditch is 5 miles long. Duck creek is the principal creek discharging water into the Laramie river between Big Springs and the head of the Cramer ditch. Duck creek is small. The lower end of it is con-



stantly flowing. Outside of flood time it discharges probably  
 698 4 or 5 feet per second into the Laramie river. In the earlier  
 months of the year it flows considerable water for a short time  
 but not long. The flow is the heaviest in this creek about April.  
 It does not flow very much water during June. More water in the  
 fore part of the month than at the latter part. April to May is the  
 heaviest flow of water. There are springs along Duck creek feeding  
 it. It heads in the Black Hills range. The headwaters of the creek  
 are almost due north of Big Springs. There are two principal  
 branches that unite to make the creek proper. North Duck Creek  
 and Main Duck Creek. Dodge creek is a small stream. It  
 699 enters the Laramie above the tunnel. I know the Collins  
 creek, McFarland creek and I know of Lee's ranch and some  
 springs there. These join to form a creek which empties into Duck  
 creek very near its mouth. There are no streams coming into the  
 Laramie river from the south side during its progress between the  
 tunnel and the head of the Cramer ditch. There are some very  
 small springs.

That land is about 700 feet lower than our ranch at Big  
 700 Springs. They raise both hay and alfalfa on the Seward  
 ranch. Very little of the 80 acres is in native hay. Mostly  
 in alfalfa. The Mertz place has a couple of small reservoirs. They  
 fill them from the river through the Cramer ditch. The Mertz place  
 is irrigated principally to alfalfa, he raises some small grain. The  
 Northrop ranch has about 40 acres of irrigated land under this ditch.

It is cultivated principally to alfalfa. They commence to cut  
 701 their alfalfa the latter part of June. They generally figure  
 on two cuttings. There is some water flowing all the time  
 in the Big Laramie at the cañon, very little at times. It gets pretty  
 low down below the Wheatland Development Company's dam.  
 There is a little seepage at that dam. It gets some water from Duck  
 Creek, and some from Little Springs. There are a very few springs  
 through the hills below the dam. Mr. Seward is engaged in the  
 cattle, sheep and horse business. They run considerable stock. The  
 Mertz ranch and the Northrop place are stock ranches. I live on my  
 ranch 52 miles north. It is 5 miles directly east of the Big Springs.

MAGGIE H. GILLESPIE, a witness on behalf of the Complainant.

Direct examination by Mr. N. E. Corthell:

703 I have lived on the Laramie River since 1883, 32 miles  
 north of Laramie City. My husband took up the ranch in  
 1882 and took me there the spring of '84. He died in 1907 and I  
 have carried on the business since. I have three irrigating  
 704 ditches. On the east side of the river the Gillespie-Dunn  
 ditch started either in 1887 or 1888. My husband bought a  
 half interest in the ditch in 1888. On west side the Dunn ditch  
 was taken out either in 1887 or 1888, I am not sure which. I  
 bought the Dunn interest in 1891 or 1892. The individual Dunn  
 ditch is a year older than ours. We bought that in 1906. Since  
 the times mentioned, we have been the sole owners. We also have

a short ditch half to three-fourths of a mile long, the Ione Lake and Laramie River Ditch, built in 1890. All the water from these ditches is taken out of the Laramie River. We irrigated 140 acres under the Gillespie-Dunn ditch.

705 Under the Dunn ditch on the west side 190 acres and under the extension which we started in 1908 and completed in 1910, 125 acres were irrigated; from the Ione ditch 620 acres. That ditch was made in 1890 and irrigated that land since whenever we had water. We take the water out for that ditch without a dam. There is a shortage of water after the flood water goes each year. The ditch is taken out from the bottom of the river, but when the river is low we can't get water.

706 That shortage has been every year but one. On the irrigated land we raise barley, wheat, oats, hay and alfalfa. Ione Lake was formerly filled with water but dried up after these big ditches were made before 1890. It was dry two or three years before we tried to irrigate it. Wheat is not very successful, because our season is so very short. Sometimes it ripens, sometimes it does not.

706 Cross-examination by Mr. Delph E. Carpenter:

The Gillespie-Dunn ditch has irrigated about 140 acres for a number of years. It is native hay land. We never had anything but native hay except on Lake Ione. We didn't get over 25 or 30 tons this year because we didn't have the water. The river was low. The Gillespie-Dunn ditch has a log dam. It has two headgates, one goes to the Gillespie-Dunn ditch and the other to the Dunn ditch. It irrigates about 190 acres along the river. It is better land on that side than it is on the east side, because it is lower. We are not able to get water into these ditches when the water is low in the river. Owing to the fact that the dam is not in very good shape we have not been able to take the very low flow of the river in the past years. In 1906 we made an extension of the Dunn ditch so as to bring it down to the home ranch. My husband had it surveyed and plowed some in 1906. I got an extension from the state engineer.

709 I completed it in 1910. That ditch irrigates 125 acres in the school section and in section ten. Owing to the water being low, we didn't get any water through that extension ditch. These ditches were originally builded to utilize water at the high stages. We used to have a dam between 31 and 6, and after the river kept getting so much lower we went a mile up the river and made another dam. We haven't got it high enough the way the water is now to utilize any water at all. We could not take water out of the river at very low stages. The 40 acres which I irrigate as a part of a desert claim is between the new dam and the old one. It lies partly on one side and partly on the other side of the river, these ditches go right through it. I have a little plot of it. The land on the desert claim is irrigated partly by one ditch and partly by another. We made the extension of those ditches up the river on Sep-

tember 16, 1908. We did not get the water onto this desert claim until 1911.

710 The Ione Lake ditch was built in 1890 to irrigate that tract of land which was known as Ione Lake. Ione Lake drained out and dried up. We raised 101 bushels of oats to the acre the second year we sowed it. We raised a little the first year to see if it would grow and the next year we put in probably 100 acres. We raise principally timothy and alfalfa on Lake Ione

bottom now. About  $\frac{2}{3}$  of the 620 acres irrigated by this ditch is in native hay. That has come in there since 1890.

711 The soil didn't have a weed or anything on it when we sowed the oats. Since that time  $\frac{2}{3}$  of the 620 acres has been converted into native hay meadow. There is 1300 acres in the bed of the lake. The Ione Lake ditch was built as a low water ditch, but we had water as long as there was plenty of water in the river and of late years there is just a little channel washed so low in the river that it does not get into the ditch unless it is up, it has to be up 3 feet anyway. I think that the water has to be 3 feet deep in the river before it will run into the ditch now. We put a little temporary dam at the head of the ditch to irrigate our oats sometimes, but the last 3 or 4 years we have not had enough to put in a dam. My husband used to drive stakes and put in boards to raise the water a little.

We never raised as good a crop of oats as we did that second year. We haven't raised over 400 or 500 bushels since. We would raise that on 40, 60 or 70 acres. One season we raised a fine crop of wheat but the frost got it and the tip end was ripened and left a little black spot on it. It was the nicest wheat I ever saw except that, it was good wheat for the chickens. We never sowed wheat very often. We are engaged primarily in the live stock business. We run from 350 to 400 head of cattle on the range near our place. In the winter we put them in the pasture. We have about 6,000 acres in all under fence. There is 1,300 on the lake and we rent some from the Two-Bar and then we rent some state lands. We run from 60 to 70 head of horses. About Christmas we take them off the range and put them into the pasture. There is no irrigated land between the old bed of Lake Ione and the McGill ranch; it is about 11 miles from our place to the McGill ranch buildings. The river is open to the range on both sides clear down to McGill's pasture. The range in that section is nearly all used by the Two-Bar sheep, the Swan Land and Cattle Company's sheep. The Swan Land and Cattle Company changed probably nine or ten years ago from cattle to sheep.

713 The next ranch above me is what is known as the Sholtz place, 9 or 10 miles up the stream, on both sides of the river, almost due south of me, part of which was one time covered by the Cooper lake ditch. The next ranch up stream is a little land of the Diamond Cattle Company, just above Mr. Sholtz. I don't know whether it is on both sides of the river or not. Just above the Diamond Cattle Company a man named Smeedle has a ranch but I don't know whether his land reaches the river or not. His land lies

714 between the Oasis and the Diamond ditch. Mr. Bosler principally owns the Diamond ranch; it was first settled as the Boughton ranch. Mr. Boughton made that reservoir and got those ditches out first. I think he got that ditch before we got any of our ditches and had the reservoir site arranged and all, and they bought hay from us when they were building the ditch, the contractors. The Ghost ranch comes in there just above the Smeedle ranch, southeast of Bosler station. They cross the river at his ranch to go to Bosler station.

715 Cross-examination by Mr. Fred Farrar:

The only land upon which we have raised grain is in the Lake Ione Bottom. We have no plowed land at all outside of this lake. Outside of the lake bed the only crops which we raise are native hay. There has always been water in the river past our place. Two years ago the river was so low we could jump it. The Lake Ione ditch goes right across from the river to the lake. It is not over half or three quarters of a mile long. We built two little cribs at the headgate of the Lake Ione ditch. We put planks up against them to raise a temporary dam and throw water out into the lake. We don't need the water very much after high water except for grain. We can flood it good in high water for hay, but we always need one irrigation  
716 after the water gets low for grain. The Gillespie-Dunn and the Dunn are each parallel to and very close to the river. The land which is irrigated from them lies between the ditches and the river; the river bends so much that it varies from a few feet to probably 50 yards. At the time Lake Ione contained water there was a small channel that led into it in high water, where we took this ditch out. We just plowed it and put in headgates to irrigate from. The lake was never drained by artificial means. I could not give you an idea of the depth of that lake bed. It is very shallow.

We have lots of wind. We have frost all the year at our house. We have had our garden nipped in July. We usually sow in April, spring wheat. Our nearest railroad station is Lookout. It is 7 or 8 miles from the ranch, on the Union Pacific.

E. D. TITUS.

Direct examination by Mr. N. E. Corthell:

718 Between the Heart ranch and the City of Laramie, Sec. 13, T. 15, R. 74, and Sections 7 and 18, T. 15, R. 73, are irrigated through the old Hutton Pick-up ditch. They could not hold a dam in the river and they kept changing from one place to another to get water on the land. It was at one time known as Grant's River ditch. The original ditch was built in the early '80s. West of Five Mile there is something like 500 acres covered by that ditch, being that part of Section 13 lying west of Five Mile Creek in T. 15, R. 74.

719 It also irrigates a small piece in Section 12. At one place where a lateral crosses Five Mile Creek, there is a flume. At

another place Five Mile Creek is dammed up. Sections 7 and 18 in T. 15, R. 73, are irrigated from a ditch built by Mr. Grant. It is known as the Le Roy Grant place. We called this and the other ditch that I have spoken of the Grant Ditches. Fully 300 acres are irrigated in 18 and about 100 acres in 7. This has been irrigated for the last 18 years or more, portions of it for 25 years.

720 The lands in these three sections that I have mentioned are not included in my estimate of the irrigated acreage upon the Heart ranch. These lands lie east of that ranch.

#### Cross-examination by Mr. Delph E. Carpenter:

I do not think that these lands to which I now refer are the same lands to which I referred while testifying concerning the Bilderback and Dowling ditches and the Hutton Pickup or Cole ditches. The Hutton Pickup ditch and the Cole ditch are the ditches I mentioned the other day in connection with that testimony. This ditch also utilized some of the water coming down Five Mile creek whenever it came down, but I haven't seen any coming for a good many years. Five Mile creek waters were taken and utilized in what was known as the Homer ranch. I haven't seen water running in Five Mile creek, only in case of a storm, in 25 years. Five Mile Creek is made up of Lone Tree creek and Willow creek, further up. These creeks head up on Boulder Ridge. In case of a storm or high water from other causes the water comes down these two creeks and then joins to make Five Mile creek and flows on down to the Laramie river.

Five Mile creek enters the Laramie river in Sec. 12.

722 On Sec. 7, I think it was three years ago, young Grant had in about 20 or 23 acres of oats. The balance of this land was irrigated for meadow. Prior to three or four years ago these lands had been irrigated to meadow, including that portion since plowed. Native hay meadow. It never produced as much of a crop of hay as they raised up in the Dowling ditch district. Three years ago they put up as much hay to the acre, it looked to me, as they did on the Heart ranch. The production on the Heart ranch, one year with another, was superior to the production on these lands. The Heart ranch land would average then as good again as these lands. The lands of which I have spoken this morning have been used for pasture for the last two or three years. Grant put up hay for several years in succession prior to that time. These are low river bottom

lands crossed and recrossed with old river beds. They are  
723 the northern extremity of the lands irrigated by the Bilderback and Hutton ditches, located at the point where the bottom ends butting up against Soldier creek. Soldier creek is a tributary of the Laramie river, entering about a mile and three-quarters east and three-quarters of a mile north from the mouth of Five Mile creek, in Sec. 5, Tp. 15, R. 73.

#### Cross-examination by Mr. Fred Farrar:

There was only one of these Grant ditches other than the Hutton Pickup. They first took water out of the river in Sec. 12. The dam

went out and they then tapped the river in Sec. 13 near the quarter rock on the north side of Sec. 13, and in the northwest quarter of 13, they put in a dam. That went out and they extended on up into the southwest quarter of 13 and put in what they called a low water ditch, a ditch that could draw water at any time. The Grant ditch now runs practically across Sec. 13, in a northeasterly direction to Sec. 18 and Sec. 7. I don't know whether they put in a headgate. The owner of lands in Sec. 13, lying west of Five Mile, demanded that they put in a headgate because when he wanted to dry up his meadow to cut hay, there was no way to shut off the water. I know he made a demand on them to put in a headgate. Grant and Cole built the Cole ditch about 22 or 23 years ago. The Cole ditch 724 goes into the Grant ditch. The headgate of the Cole ditch has also been changed. It was in 27. The main Grant ditch is about a mile and a half in length. It is just a small ditch. The lands that were thus irrigated were known as the Grant and Knabler ranch, at that time.

The water which we are now taking out of Lake Hattie we are using on Pioneer lands. Part of it is going into the river through West Ditch No. 1. That ditch is in Sec. 14, Tp. 15, R. 74. I have been running water down that ditch into the river for more than a month. There have been from a few feet to as high as 35 feet per second discharged into the river during that time. That is not the normal waste of Pioneer canal. We never have any waste water to run into the river through this ditch only in a storm. In this case we are running water through the outlet ditch of Lake Hattie to the bifurcation works of the north and south canals, then into the Pioneer through the south canal and down the Pioneer to the waste ditch, then through the waste ditch to the river. There should be some water passing into the river at the end of the Pioneer canal at the present time. It also is allowed to flow into the river for the same reason. To give water to the river for the use of the Wheatland people. Practically all of the water which passes at a point west of the town of Laramie in the Pioneer canal is now being taken into the river to supply water for the use of Wheatland. There is a waste ditch from the lower end of the Pioneer canal running clear 726 to the river. We send down to that ditch what we think it will carry, outside of what is used between the two points, and the balance we discharge into the river through waste ditch No. 1. The water that has been flowing recently in the north canal has been turned out onto different tracts of land. Some of it is running into the Pioneer canal across lands on Sec. 18. This excess water goes into the river. On yesterday we were discharging into the river through these three channels from 20 to 25 cubic feet per second. At one time we were running forty cubic feet per second to waste ditch No. 1 for 24 hours. At the same time water was passing 724 ing through the Pioneer into the river, probably about 20 second feet. At one time we were placing into the river as high as 60 cubic feet per second of time from these ditches. I believe that is the largest amount we have put into the river at any one time. This has been continuous for more than a month, since some time



the latter part of July. The water is measured in the weir at waste ditch No. 1, at a weir on the mail canal at the University farm and I also took measurements. The north canal swings west in Sec. 6 north of town here, in Tp. 16, R. 73, and goes west and ends on the east side of what is known as the Big Basin. The bend is about 6 miles north of the University farm. The ditch ends on the east side of the Big Basin. Several weeks ago, after a big storm, there was a lot of water going out of the north canal into Big Basin. It went to waste, spread out over those lands, that was rain water. I have not allowed any reservoir water to amount to anything to run down there. A little went down there. This is the first year we have been using that ditch, we have been trying it out. There has not been water toward the lower end of that ditch all summer. The water we did take through this ditch was turned out on different people's lands to irrigate the land that was under the ditch, cultivated lands, some of them. Some of them were uncultivated lands. Most of it was prairie land, the first time it ever had irrigation water.

N. H. ROACH, a witness in behalf of the Complainant.

Direct examination by Mr. John D. Clark:

729 I have resided at Laramie 32 years. Have been surveyor 16 years. I know the lands at one time owned by Le Roy Grant in Sections 13 and 12, T. 15, R. 74, and in Sections 7 and 18, in T. 15, R. 73. Have known them 15 or 16 years. Acquaintance has been close for 5 or 6 years. Know the amount of land irrigated from the Laramie River in those tracts. In Sections 7 and 8 about 507 acres are irrigated. I measured the irrigated lands under the Cole ditch in Sections 12 and 13, T. 15, R. 74. My recollection now is that it is 380 acres. The ditch was there before my time and the lands irrigated ever since I can remember.

731 Have known the Grant ditch 10 years. The land under that ditch has been irrigated continuously since that time until the last few years when they couldn't get any water. The water gets so low they can't get any. Know the John A. Fischer ditch. Surveyed it six or seven years ago. It has been there eight or ten years anyway. Think it is seven miles long; Carrying capacity eight feet wide and thirty inches deep. It irrigates about 3,000 acres.

732 Part of the lands lie in Sections 7, 8 and 9, T. 14, R. 75. Then there is Section 17, part of 16, part of North Half of 21, same Township and Range. The ditch was old when I made the survey six or seven years ago. The land was irrigated then and is still irrigated.

Cross-examination by Mr. Delph E. Carpenter:

732 The first ditch of which I spoke is known as Grant's ditch. We always called it the Le Roy Grant ditch. It irrigates about 307 acres. There is supposed to be about 115 to 118 acres on

the Grant place irrigated from Soldier creek. It would be on the east half of Sec. 8, somewhere along there. That was irrigated from a separate ditch on Soldier creek. That ditch is not a continuation of Grant's river ditch. This 115 or 118 acres irrigated from Soldier creek lies on the west-side of that creek. Grant's river ditch runs into Soldier creek. Soldier runs off into kind of a slough on the north part and catches any waste water that comes down. The east half of Sec. 8 was irrigated by Charles Connor's home ditch out of Soldier creek. I wouldn't say that this 115 acres irrigated from Soldier creek, of which I spoke, is on the east half of Sec. 8. I don't remember whether Grant's land run over on the east line. I do not know whether or not any portion of 18 is irrigated. There are 40 acres on 18 on the Grant land that is not watered from the Grant ditch. On the Grant place there is a total of 507 acres under irrigation, leaving out that irrigated from Soldier creek, 100 and some odd acres. The whole west part of the Grant land, 160 to 180 acres, was all watered from the Grant ditch on the Big Laramie River. When I speak of the Grant land I refer to Sec. 8. I think Grant owned a big part of Sec. 7.

After the Grant ditch leaves its headgate it runs in a northeasterly direction. It irrigates the bigger part of the land east of the river in Sec. 7, from the ditch to the southwest corner of Sec. 7. I might have been in possession of the Grant land a couple or three months. I simply bought and sold it on speculation. I was dealing for it along in the summer about haying time. There were 286 tons of hay there at the time I was figuring on buying the ranch. That was that year's cutting, from 626 acres, I think. It was native hay. Jim Mead owned Sections 12 and 13, Tp. 15, R. 74. There are 40 to 50 acres out of the land that are not irrigated, my recollection is 440 acres altogether. About seven or eight years ago I was out there and did considerable surveying for Grant, running off his lines and such as that.

I stated that I made a survey of the Fischer ditch some ten or twelve years ago. The ditch irrigates about 3,000 acres. There is a part of the northwest quarter corner of Sec. 7 that the ditch does not irrigate. I don't think there is anything raised on Sec. 7, there is some hay down there. There is one lateral that runs up pretty well along the west side of Sec. 7 and further up there are two others that I ran out. I don't know whether they ever dug them or not. The idea was to facilitate the irrigation of the land. It was there to irrigate. My recollection is that the greater portion of Sec. 8 was under irrigation. Some of it in alfalfa and the rest of it in native hay. I am almost certain that there is alfalfa on 8. I know there was alfalfa there up to the last year. I don't know how much of Sec. 8 has been plowed in the last five years. Sections 7 and 8 are part of this 3,000 acres irrigated. I can't tell you what portion of Sec. 9 was irrigated. There was some hay cut there one time. In this country we consider anything that will cut half a ton of hay to the acre as hay

land. I think that portion of Sec. 9 which was cut produced a half a ton of hay to the acre. The west half of the section, up to the time Fischer sold it, was producing hay. I stated there was some land irrigated on Sec. 7. I would say all of the section was irrigated. 160 acres, I would judge, south of the road has been used for crops. That is not the field in which I thought the alfalfa was growing. Mr. Grable's new buildings are on Sec. 17. I said about 120 acres were irrigated on Sec. 16. On the south side of the county road, and a little corner over on the north side. There is a little pond in there north of the road. There are three or four ponds in that vicinity when they are irrigating. The seepage from the irrigation ditches makes these ponds. I believe that fully 100 acres have been irrigated south of the county road on Sec. 16. That would be in addition to the 3,000 acres I mentioned. Fisher owns a part of 21. That is irrigated from the Fischer ditch. Haven't I got enough land? There is 3,000 acres there all right, it is close onto 3,000 acres. I think I have included everything I want to in this list. I am very positive about this school Sec. 16. I could not possibly be wrong, I went out there with a party that bought the land to look at it. The section has never seen a plow but it has the water. It does not have very extensive laterals. I could not tell you how many miles of laterals there are on that section. There is more than a rod or two of laterals, one goes quite a ways. I could not tell how long it is, but it is more than a rod. There is one little lateral that cuts across from Sec. 17 down near the southeast corner of that section and runs across the southwest corner of Sec. 16 so as to carry water down to Sec. 21. There are some other laterals up north of the center. There is another lateral runs through there. There is a little pond on 16 too. I think I have been a little closer in describing the land irrigated on the Grant land than I have on the Fischer land. I think I am approximately correct, however, on both tracts.

742 Cross-examination by Mr. Fred Farrar:

The past two or three years we have been short of water on the lands near Laramie, Sections 7, 8, 18, Tp. 15, R. 73, and Sections 12 and 13, Tp. 15, R. 74; 1913; this year; in 1911 and 1912.

743 I don't know whether the amount of water flowing in the stream would be increased or decreased during the distance you have mentioned. I could not say that I know anything outside of the inflow from the Pioneer canal that would increase the flow of the river. The flow of the Laramie river in 1912 might have been normal, I wasn't on the river in 1912 at all. I do not as a matter of fact know that they had no water for irrigation on these lands last year, they were down at the office telling about it. There was no hay put up. I am certain that the shortage in the amount of hay was due to there being no water to irrigate. I was over there to see if I could fix it for a party in the east. 1911 was not a normal year down here. There wasn't enough water to get down here. There was some water in the river down here in

1911. There is no permanent dam at the head of the Grant ditch. At one time they had dams in the river but they moved the headgate up stream some three or four years ago. Had there been a dam we could not have diverted the water from the river for irrigation of these lands within the last year or two. In 1911 there was not enough water for June irrigation. It is pretty hard to say whether or not there would have been enough water had there been a dam in the river. There is a doubt whether or not there is enough water in the river during the month of June to irrigate these lands. There wasn't any more water in July, 1911, than there was in June. There wasn't as much I don't suppose. There was considerable water in May, 1911. There was more water in the latter part of May, 1911, than there was in June, more water in May than there was in July. I could not tell exactly when the highest water occurred but I suppose the latter part of May and the first of June. That is generally our high water. It varies considerably in some years, six week's difference. I could not say as a matter of fact whether our highest water in June was in 1911 or the latter part of June. I do not think there would be any more water just above the mouth of the Little Laramie than there would be here. Unless water were put in artificially there is nothing to increase the stream. There are two or three ditches that take out water. It is probable that there would be more water in the river here or in the vicinity of these five sections than there would be just above the junction of the Big and the Little Laramie rivers. Unless seepage has something to do with it, I should not think that the flow of the stream just above the junction of the Little Laramie would be greater than the flow of the stream in the vicinity of these lands. There is considerable seepage in this country. I have noticed it within the last five years. Since then I don't know whether or not it increased. There is some water returning from seepage into the stream all the time. This will naturally increase as the length of the period of irrigation increases.

N. H. ROACH.

Redirect examination by Mr. John D. Clark:

746 We placed these sacks filled with earth in the river at the headgate of the Grant ditch this spring to get water up in the ditch.

747 We have had trouble in one way and another since 1909 in getting water into the ditches, caused by a lack of water. We put in these sacks about the 10th to the 15th of June this year. The water had pretty near stopped running in the ditch.

Recross-examination by Mr. Fred Farrar:

The bottom of the ditch is about on a level with the bottom of the river. It is on the level unless it fills up with sand or something.

CHARLES BELLAMY, a witness in behalf of the Complainant.

Direct examination by Mr. N. E. Corthell:

748 I have lived at Laramie for over 30 years. Have been civil engineer and surveyor since '78 or '79. Am familiar with the irrigation of lands along the Laramie River, quite familiar with the Boughton ditch. It was first constructed in 1884. I measured its carrying capacity in 1886.

749 Measured officially as Deputy County Surveyor; found the capacity of the ditch 116.97 cubic feet per second. In 1907 I surveyed the lands irrigated from the ditch. It was something over 7,000 acres. Don't remember the exact amount. It was almost all of it under irrigation in 1887 and 1888 but they added a little from year to year. I don't think any has been added since 1907.

750 The headgate was carried up the river in September and October, 1907, Before that they had difficulty in getting water because the dam would sometimes break. The ditch takes its water from the Laramie. I made a re-survey for the reconstruction of the Fischer ditch in 1888. It is located in Ranges 75 and 76, Township 14, and takes its water from the Laramie. About 3,000 acres were irrigated from that ditch.

751 The land was first irrigated in 1887. In 1893 I made preliminary surveys for enlarging the Pioneer Canal. The old flume leaked and I put in a new flume. The ditch as it now stands runs almost identical on my lines. It is now the Lake Hattie Supply Canal. In 1886 Mr. Loback and myself ran a number of lines west of town all over that country. It was a mere reconnaissance. The next year, 1887, Mr. Loback made a survey of the high line. That is almost the same as this continuation from the Lake Hattie Reservoir down over these lands.

752 CHARLES BELLAMY.

Cross-examination by Mr. Fred Farrar:

At that time I used the Colorado formula in arriving at the capacity of the Boughton ditch. I took the area and the fall and constant 15 and multiplied these together and divided by the wet perimeter 9, and took the square root. That would give the velocity and then the constant for friction would be something from .5 to 1, a flume being 1 and a very poor ditch overgrown would only flow half as much. Then you took the area and got the number of cubic feet. It is the same formula that Colorado used. I don't know whether Colorado still uses it, but it was used for a number of years. In order to determine the fall I used to run down about half a mile. I based my calculations on the fall per mile. I used a constant for friction of .65. It might be .85 (witness examines his books). It is so dim I am not sure. In my final conclusion I took the  
753 fall as one foot per mile, it came very near that. In working out my capacity, I used the top width at 22, bottom width 9.5 depth 5, wet perimeter as 25.14 and the coefficient of friction as 65. I

think the canal is about 12 miles long. I made the official measurements in 1886. I made a report, I filled out the blanks. They were filed at the court house. The territorial officer was the county clerk. When I handed them over to the county surveyor I knew he paid me for that and said that Boughton had filed it. I never looked out to see.

The 1907 survey was done to determine the amount of land capable of irrigation. It determined the amount of land they were actually irrigating that season. I could not tell whether or  
754 not the irrigated land had increased from 1886 to 1907.

There was no time between '86 and 1907 that I could give the actual amount of land irrigated. I do not have a blue print showing the land irrigated under this ditch. I do have one under the Fischer ditch. The first dam that was put in the Boughton ditch was just sacks of sand and where the high water came it worked kind of in under it and it settled down and then it pushed it right aside and let the water out. That was in 1885. In 1890 it broke out again and then in 1906 it went out and in 1907 was when I made the survey and superintended the construction up at the new headgate. The old dam was right straight across the river. I think it must have been over 100 feet long. It was up to the bank on one side, which was about 5 or 6 feet, and on the other side it ran out, high enough to keep the water from cutting around the end. The dam must have been 5 or 6 feet above the bed of the river.

The sacks were just laid in as though they were rocks and  
755 kind of pounded in. They did not seem to be bound or keyed in any way. I suppose they thought the weight of them would hold the water so it would run over without moving them but it was not wide enough and the water got underneath and it slipped out. When the change was made the dam was made of cribs with rock and timber and then filled with sacks of sand and rock and earth and different material. We put in a concrete headgate. There was a wooden headgate at the old place. I do not have a list of the lands irrigated by that ditch, I turned that over to Mr. Boughton. The land that I measured was all between the river and the ditch and then the lake they had for sort of a reservoir. The lake was mostly in Tp. 20, R. 74. It ran down a little into 19. That lake lies right in here somewhere (indicating on map). Probably Sec. 34, Sec. 27 and a portion of Sec. 28. The lake does not have any name. It was used for irrigation. They let it fill up every spring and held  
756 it. I know in 1907 they used it. I haven't been there since the summer of 1907. The buildings on the Diamond ranch are a little west of where that lake is. I cannot give you the size and capacity of the lake. The lake was originally a natural depression in the ground and it would be meadow before the ditch was there. Mr. Boughton made a reservoir out of it in 1885 or 1886. The Boughton canal runs up pretty close to Lake Ione. It lies west near the lower end of the canal. I do not know how big the lake was. I should think that it was a little over 100 acres. In 1907 there was about that much water in it. They could not draw all of the water in the lake for irrigation. I think they drew out enough to irrigate



a field of grain of about 100 acres. This survey made by me was made preparatory to Mr. Boughton's selling the ranch. This ditch, for about half its length, runs close to and parallel with the  
757 river. From that point on the ditch swings somewhat to the west, while the river runs almost due north. The soil of the land under irrigation is a gravel and some loam, which I call gravel or sandy gravel. In 1907, when I made this survey, the Iron Mountain Cattle Company owned the ranch. There is high land extending north and south and immediately east of the river in or about sections 5, 6, and possibly 17, Tp. 19, R. 74. I did not take that into consideration, that section and some of this (indicating). There is a high ridge there. It is high in Section 5, some in 8, some in 7 and 6 and also in part of 9. This high land was not included in my estimate of 7,000 acres. In my survey I didn't allow anything in 4, 5, 6, 7, 8 and the west half of 9, Tp. 19, R. 74. A considerable portion of Sec. 31, Tp. 30, R. 74 is low, seepage land, that is not good land. I did not go west of that lake at all. There is a lake in there. I suppose that lake will run over and make that poor ground.

It is the lake I formerly referred to. There is a draw which  
758 runs into the lake. That draw concentrates the water from a considerable area, that is what made that lake, but there was no ditch in wet season. There was always water in there in the spring time before the ditch was built. It would sometimes dry up in the summer, but there was always more or less water. The lake is something over 300 or 400 acres and there might be even as little as 100 acres. That water was the natural water from drainage. This ranch is known as the Bosler ranch, that belongs to the Iron Mountain Cattle Company. It is a cattle ranch. It produces mostly native hay. I don't think they cut on all the 7,000 acres. I know they used to cut over 5 or 6 sections there. The balance was  
759 used for pasture. There was about half a section they raised grain on. I know they cut over 2,000 to 3,000 tons of hay there some years. I cannot locate the land upon which they raised grain. They raised oats. They also tried a little barley in the year 1907. I know of their raising it two years. I do not know what success they had with barley. They had very fair success with oats in 1907. I believe the Iron Mountain Cattle Company still owns the ranch.

760 Cross-examination by Mr. Delph E. Carpenter:

The river takes a bend towards the west in Sec. 27, Tp. 19, R. 74 and runs 4 or 5 miles almost to the west line of that township. It runs due north and south through the west tier of sections and the remainder of Tp. 19, going north, and also Secs. 19, 30 and 31 in Tp. 20, R. 74. There is a hill that begins at Sec. 9 and runs north into 29, Tp. 20, R. 74. That hill throws the river to the west. On the east of the hill, at the north part of the Boughton meadows, waters accumulate, forming a shallow lake during irrigation each  
761 year, a waste lake and the drainage from the hills to the east. Some years there would not be much water and then there would be only 100 acres and over 600 acres in very wet years.

I did not include that waste lake of about a section in figuring my irrigated land. I only came to the edge of that. There is meadow land to the east of that lake in the southeast quarter of the township, in 3 or 4 sections. That meadow land extends south to the Diamond ranch buildings. Hay was cut from the buildings north down to the north line of the place.

During this survey I ran the instrument. I cannot give my assistant's name. I done almost all of it by stadia measurements. He would go by the Government subdivisions and when he would come to any irrigated land he would give me a signal and I would take the angle and distance, and in order to know where I was I would have him hunt up the corner. Not having a chain man I used that method. In some instances I might have been ascertaining not only the area actually irrigated but also the irrigable area under that ditch, and perhaps there might have been places where they had not irrigated that much.

#### Cross-examination by Mr. Fred Farrar:

At the time of making the survey in 1888 of the Fischer ditch, I enlarged it and made it deeper from the headgates for about four miles. I made a survey of the lands under that ditch in 1888, lands mostly that were capable of irrigation, because that was the first year he had had water running. I know that out of 3,000 acres of land surveyed in 1888, one half or 1,500 acres of it was irrigated. In 1891 or '92 I went over it with him. The 1,500 acres, or approximately one-half, was not producing. It might have been irrigated but he had not got any crop from it. About  $\frac{2}{3}$  of the 1,500 acres was in hay and about  $\frac{1}{3}$  in alfalfa in the year 1892. He did not plow up hay lands to plant alfalfa. There was natural land, pasture land. Hay lands are, as a rule, bottom lands, naturally wet:—the uplands have to be irrigated to produce anything. They do not naturally raise native hay on the upland. The land he devoted to alfalfa was upland. He cut alfalfa on the land he had in 1892, 4 or 5 years after that. He also cut alfalfa there in 1900. I hand you the plat showing the lands which I found to be susceptible of irrigation under this ditch. It only shows the east half of Sec. 8, Tp. 14, R. 75. I have only this plat, but knowing where the ditch comes up onto the bench and that all that land lays lower, and that he was the owner of Sec. 9, and leased Sec. 16 and the north half of 21 and Sec. 17, and the southeast quarter of 18, and the north half of 20, he irrigated. The north half of 20 was not his own land but he irrigated that. Section 20 belonged to Mr. Mansfield. He would allow Mr. Mansfield to take water onto 20. The north half of Sec. 20, owned by Mr. Mansfield, formed a part of the 3,000 acres which I mentioned as being under the ditch. The whole of Sections 16 and 9, and the east half of 8 and a portion of the southwest quarter of 8, the whole of 17, the east half of 18, nearly the north half of 20 and the north half of 21 constituted a part of the 3,000 acres. These lands are all in Tp. 14, R. 75. That was the total which could be irrigated from this

ditch. I know this east half of 8, a desert filing by his wife, was irrigated. He had me go out there in order to be sure to cover every bit of that, and that is what this map was made for. Relative to the survey of this ditch, I will state that the ditch had been surveyed down to this fork in Sec. 18. That was the old survey and I ran over that and from where the headgate is in Sec. 32, Tp. 14, R. 76, I ran over that to correct it, because it was poorly constructed. I followed the old ditch, cut it deeper, put in a true grade and got onto the bench without making an extra excavation. From Sec. 18 I ran by having my rod man pace 50 or 150 feet at a time and raise the target. I was new from this point. The old ditch to this point would carry water but it was such a poor grade that in Sec. 26, Tp. 14, R. 76, he had to continually bank up the lower bank, which was a hillside, to get water about 4 feet deep to carry it beyond. Prior to my survey he could not get much water on Sec. 18. That was the year before it was reconstructed. The ditch is 11 miles long. In reconstructing we started at the headgate with 8 feet wide on bottom and a grade of 4 feet to the mile to where it went up on the bench in Sec. 19. From that point it was made a foot or two smaller. It was 6 feet wide on bottom about center of 18, and the grade was more than 5 feet to the mile from there on. That was when it was upon bench land.

767 Cross-examination by Mr. Delph E. Carpenter:

The alfalfa planted by Mr. Fischer was located in Sections 16 and 17 and a little in Sec. 9. Most of it was south of the road and between it and the breaks in Sec. 17 where it was a mile long. There was some north of the road in Sec. 9 and a little in Sec. 8.

There are some lakes or ponds in the Fischer tract near the corner of Sections 8, 9, 16 and 17. A pond is formed there by this ditch which never used to be there. After he irrigated, some of this land became native hay land, either from seepage or irrigation. In 1888 there was no land north of the county road which is always moist and would produce native hay. One lake formed after this ditch had been built a year or two.

768 Possibly much alfalfa killed out from excess of water.

After 1888 I paid very little attention to the property. I was out there seldom. He would have me come out for some little lateral or something. There would be as much irrigated land now as ever if he still owned it. He disposed of it some 4, 5 or 6 years ago. North half Sec. 21, which he irrigated, is native hay land on bottom. All the rest is bench land. The bench runs close along the north line of 21. The north tier of forties is broken by it. Mr. Mansfield owned that in 1888, now owns it and lives there.

769 Some reconnaissance work was done in 1886 or '87 relative to the Pioneer. They did not proceed with the construction. It was simply to see the possibility of sometime running a ditch there. We started with two buggies and I could get out of one, set up the instrument and send the man ahead where I could take a long sweep and sight with my gradient what the fall for the ditch

would be, allowing it to run nearly straight and then allow a little and then have him hold the rod with the target the same height as the instrument. Then I would ride to him and he would go on. We spent two or three days going over the plains between the two rivers. Mr. Loback did the same in '87, only he staked out a line. No construction was done. The matter was to take a ditch from the Pioneer and run it at higher elevation with a little less fall. The Pioneer there has a very heavy fall, in one place, and we thought by coming out ahead of that and around to see how much more he could take in by making a high line of it and picking up waste fall. I believe that the present High Line ditch at Lake Hattie, for making a Lake Hattie reservoir, provided my stakes could be found, would be identical. I think Mr. Loback's survey was very nearly the same as the present ditches were run. We ran both around and below Lake Hattie. It took quite a ditch to go around. That  
 770 was in 1893, and I had started to stake this out when the panic came on and everything shut down and they dropped it entirely. They had engaged me to make complete survey and give the cost for all work and determine how large Lake Hattie would be and how much of a reservoir that would make. I was engaged by Mr. Balch of the First National Bank, president of The Wyoming Central Land and Improvement Company, the owners of the Pioneer. I don't think that work was resumed by the Goldsborough people or Mr. Grable and his party until 1908; I am not acquainted with engineers or promotion of later proposition. I am not acquainted with Mr. Wendelkin or Mr. F. C. Grable. The only one of the Laramie Water Company's engineers I know is Mr. Bishop, whom I have met several times. He has been working in this section about 4 years. There was nothing done until Mr.  
 771 Grable or Mr. Bell took charge of the promotion. I don't know when they began. There were no filings made on my original survey which was incomplete.

Cross-examination by Mr. Fred Farrar:

I believe you might say that flume was the construction done under the surveys made by myself and Mr. Loback in 1893, because so much larger than was necessary, and made on purpose so if they ever did construct the High Line it would not have to be changed, but aside from that there was nothing, no construction work whatever.

The present works are entirely disconnected from my surveys and also the 1886 and '87 surveys by Mr. Loback and me which ended in naught. Lake Hattie was not a reservoir in those days.

Redirect examination by Mr. John D. Clark:

772 In connection with the Boughton ditch, the surveys were attempted to be made so as to show the lands that had been irrigated. I don't know of any lands included that have not been irrigated, but it is possible there might have been small tracts.

## 772 Recross-examination by Mr. Delph E. Carpenter:

I am Charles Bellamy who has made a series of maps of Albany county and Laramie, Wyoming, from time to time over a period of years. They are from my observations and knowledge of the country and also copied from official plats in the land office and records in the county clerk's and state engineer's offices. While I have been in Laramie I have been engaged in surveying. My son, Benjamin C. Bellamy, was associated with me.

LYMAN E. BISHOP, a witness in behalf of the Complainant.

Direct examination by Mr. N. E. Corthell:

773 I am a civil engineer. Reside in Laramie. Resident Engineer for the Goldsborough Company on the Laramie Water Company's work. Came here July 1, 1910. Been engaged in this work continuously since that time. From July 1, 1910, to January, 1911, I was engaged in final location work in connection with the canals system, mainly on the Little Laramie.

774 In June, 1911, I located the last mile of the Lake Hattie Supply Canal No. 1. August, 1911, I located Lake Hattie Supply No. 2, supplying Lake Hattie Reservoir from the Little Laramie; September 1911, made the final location of Bell Supply Canal No. 2; from March, 1912, to the middle of January 1913, was Resident Engineer in charge of construction work for the Goldsborough Company. During 1912 I did construction work on Stewart Canal, Lake Hattie Supply Canal No. 2, extension of North Canal, Bell Supply Canal No. 2, Lake Hattie dam, South Canal and Pioneer Enlargement. Also made preliminary and final location surveys of Lincoln and Warren ditches and Pioneer High

775 Line. Pioneer Canal enlargement and Lake Hattie Supply Canal No. 1 take water from the Laramie, and Lake Hattie Supply Canal No. 2 from the Little Laramie. These ditches supply Lake Hattie reservoir. Stewart Canal receives water from Lake Hattie Canal No. 2. About 700 stations of Stewart Canal constructed, ninety to ninety-five per cent completed. This constitutes 14 miles of the ditch.

776 When I came, construction work had been done on Pioneer Enlargement, Lake Hattie Supply No. 1, Lake Hattie dam and North Canal and bridges and bifurcations at Sodergreen Lake had been installed. Nothing had been done in the construction of the head works on the Big Laramie at the Pioneer Enlargement. From Lake Hattie to station 985 in the North Canal there was then about ninety-five per cent completed. That was about 19 miles of the upper portion of the canal.

777 From July 1, 1910, to December 1, 1910, the work of various surveys cost about \$5,000.00. Prior to December 1, 1910, the Lake Hattie Reservoir & Irrigation Company had expended about \$944,000.00 on that system.

778 December 1st, 1910, the project was merged with the Interstate. During 1911 Lake Hattie Supply No. 1 was com-

pleted and water turned in during July. The construction work was likewise in progress on Lake Hattie Supply Canal No. 2 and the head works, and the Pioneer head works were built, and concrete facing on Lake Hattie dam was in progress. In 1912 construction work was in progress on the Stewart Canal and Lake Hattie Supply Canal No. 2, and the extension to the North Canal, Bell Supply Canal No. 2, Lake Hattie dam, South Canal and Pioneer Enlargement. Since the middle of April, 1913, construction work has been in progress on the lateral system under the North Canal extension and structures on Lake Hattie Supply Canal No. 2; completion of the South Canal and structures on the North, South and Stewart Canals and construction work at Lake Hattie dam.

779 The total expended on this irrigation system up to date is about \$1,418,000.00. It will take about \$34,000.00 to finish the Pioneer Enlargement and Lake Hattie Supply No. 1. Lake Hattie Supply Canal No. 2 and the head works are completed. Lake Hattie dam is completed. They are putting in a drainage system at Lake Hattie Dam that will probably take \$2,000.00, yet to complete. The North Canal and the North Canal Extension are completed. It will take about \$46,000.00 to complete the Stewart Canal, and about \$24,000.00 to complete the lateral system under the North Canal Extension. The South Canal is completed, with probably \$200.00 worth of work to be done on the structure at the lower end of it. The Pioneer Enlargement and Lake Hattie Supply No. 1 have been used since July, 1911. 1023 second feet were run in Pioneer Enlargement and Lake Hattie Supply Canal No. 1 for a time last season, 1912. Water was turned into the North Canal

780 from Lake Hattie July this year. It has been carrying water since that time. The carrying capacity of Lake Hattie Supply Canal No. 1 is 1023 second feet. Lake Hattie outlet canal for the first 197 stations has a capacity of 750 second feet. The North Canal has a capacity of 625 second feet to station 448. The capacity increases on down to the end. The capacity of the South Canal is 160 second feet.

781 The total acreage irrigable under the North Canal is about 21,760 acres from station 985 to 1841 and from Lake Hattie station 985 is about 21,340 acres, making a total of 43,100 acres. Under the Pioneer High Line Canal about 31,360 acres; under the Stewart Canal about 37,760 acres. The actual acreage that will finally be irrigated of these estimates after deducting roads, canals, fences, houses and pastures will be 80 to 85 per cent of the gross acreage stated.

782 LYMAN E. BISHOP.

Cross-examination by Mr. Fred Farrar:

Bell Supply Canal No. 2 takes out of Douglas creek about two miles north of Keystone, the canal is 7.8 miles long from headworks to point where water is turned into the Little Laramie river drainage. It is located and partially constructed for a capacity of 350 cubic feet per second. During the fall of 1911 and the year 1912



construction work was done. Douglas creek is a tributary of the North Platte River. It runs in a general southerly direction.

The Bell Supply canal No. 2 will divert water from Douglas Creek, bring it across the divide and empty it into the South Fork of the Little Laramie river. From thence it will be taken through Lake Hattie Supply canal No. 2 into the irrigation system described. There is other proposed development work consisting of Bell Reservoir No. 3, which will be built on the Little Laramie approximately half way between where the Bell Supply canal No. 2 empties into the South Fork of the Little Laramie and the headworks of 783 the Lake Hattie Supply canal No. 2. At the point of diversion of the Bell Supply Canal No. 2, Douglas creek is a stream that will flow as high as 800 cubic feet of water per second late in May or early in June.

The Stewart canals do not divert directly from river now. They take from Lake Hattie Supply Canal No. 2, about  $2\frac{1}{5}$  of a mile from the headworks, and the latter canal from the Little Laramie. Stewart canal is not completed. The south canal ends now on the Big Laramie about the center of Sec. 6, Tp. 14, R. 74 W. About \$2,000 worth of construction work was done on Glendevy reservoir, excavation for a cut, for a trench for a dam. That work is part of the final work for the excavation made will be used when the structure is made. There was probably between 300 and 400 feet of 784 test pits cut for the trench. That has been opened up. It averages 10 or 12 feet wide on top and 2 or 3 on bottom varies from 3 to 10 feet deep and was constructed to determine the nature of material immediately underneath and will probably become part of the permanent dam, because the cut off will be placed in that trench. It would be a very small proportion of work of final structure. It was done late in 1910 or early in 1911. That reservoir is on the Laramie river on or about Sec. 36, Tp. 10 N., R. 76 W. in Colorado, about 9 miles below the tunnel of the Laramie-Poudre system.

Sand Creek reservoir has never been constructed. The 21,760 acres which I gave under lower end of north canal covers land which it is proposed to irrigate, probably 90 per cent of the area, the other 10 per cent might now be under irrigation inefficiently. This is true with reference to the 21,340 acres under north canal from Lake Hattie to station 985. Water can be diverted from the 785 Laramie river by means of Lake Hattie Supply Canal No. 2 into Lake Hattie reservoir and then distributed through north and south canal. Water from Little Laramie in Lake Hattie supply canal No. 2 can be diverted at the bifurcation works into Stewart canal. The line of the proposed Pioneer High Line intercepts the Lake Hattie supply canal No. 2.

The Pioneer High Line canal has been finally located. A large percentage of the structures have been designed and plans prepared. Practically no construction work has been done. The headgate will be at the bifurcation works located in Lake Hattie Supply canal No. 1 at about north quarter section corner of Sec. 7, Tp. 14 N., R. 76 W. It will be in Lake Hattie Supply Canal No. 1 at the beginning

of the sluice section or sluice ditch. From that point which it is only necessary to direct water into Lake Hattie, the flow is so great it cuts its channel.

The end of the north canal extension is built and contemplated now to a point about 300 feet east of south quarter corner of Sec. 10, Tp. 16 N., R. 74 W. I have a topographic map of Lake Hattie reservoir site in my official files. It does not give depth. It was made when Lake Hattie was first thought of and there has been no addition made to it since the dam was located and the reservoir built. I have no record of capacity of reservoir at various depths. I took that map once and worked up the total available capacity of the reservoir.

The usable capacity of Lake Hattie reservoir is 68,500 acre feet. At that capacity the depth is 28 feet. The amount of dead water or the capacity not available with present condition of bottom is about 42,000 acre feet. There was a natural lake at the upper end 787 of present reservoir, originally known as Lake Hattie. It held water all the time. Before we can store any available water for use, under our present system, we have to have 42,000 acre feet in this reservoir. From this point my 28 feet is measured, making available 68,500 acre feet. At a depth of 28 feet of available water, we have in the reservoir a total of 110,500 acre feet. A portion of the 42,000 acre feet not now available can be made so by making some cuts between the three different portions of Lake Hattie reservoir. I have no information of depth of water in original Lake Hattie.

Water from the Laramie river was first placed in Lake Hattie early in July, 1911. It was first run into the reservoir from the Little Laramie in April or May, 1912. I haven't any figures to show amount run in reservoir in 1911. During that year we did not put sufficient water into reservoir to make any available. We did not fill the dead water space. There was available water in Lake Hattie reservoir in June, 1912. By the middle of July, 1912, we had available depth of between 10 and 11 feet. That is the highest we 788 had in 1912. In 1913 we had very nearly 20 feet available depth. I would state approximately 30,000 acre feet of available water in reservoir now, at the depth of 20 feet, above the lowest point at which water can be drawn off in present condition of reservoir. I would give 20,000 acre feet as a very rough estimate of water placed in reservoir in 1912 from Little Laramie. We ran no water from Little Laramie in 1913 because we had under construction two drops and some repairs at headworks of Lake Hattie supply canal No. 2. All water put into reservoir in 1913 came from Big Laramie or from drainage from Sheep mountain.

As originally located and designed Lake Hattie Supply canal No. 2, or the canal from Little Laramie, was for 500 cubic feet of water per second. During the 1912 season we had at one time 583 cubic feet in the canal and still plenty of freeboard, and since then we have built structures and so regulated the grade of the first 24 sections of Lake Hattie Supply Canal No. 2 that now its capacity would be about 750 cubic feet per second. The map prepared by the Irriga-

tion Investigation, United States Department of Agriculture, compiled and drafted by Fred C. Scovey, Irrigation Engineer, does not accurately delineate existing conditions on the system as regards construction. All of the canals as shown on this map have not been constructed in their entirety. Mr. Scovey did not get the information concerning this system from me.

Cross-examination by Mr. Delph E. Carpenter:

The first work on Lake Hattie Supply Canal No. 2 was done by inaugurating the Pioneer location in July, 1910. August 1911 was the first actual construction work on Lake Hattie Supply Canal No. 2. The contract was let for building the canal and we started active work on the head-works and diversion dam by force account. This canal takes its water from the south bank of Little Laramie river. Its head is below the point at which Bell reservoir No. 3 was to be constructed. Bell reservoir No. 3, if constructed, would be a channel reservoir. It would have no inlet ditch and be across the bed and channel of the Little Laramie river. It could be used as a storage and also as an equalizing reservoir. Early in the season a considerable amount of water carried by Bell Supply No. 2, not at that time needed by the Stewart canal, could be held in this reservoir until the demands of the Stewart canal became greater than the supply of Bell Supply Canal No. 2.

Bell Supply Canal No. 2 involves about 7 or 8 miles of very heavy construction work. This is a mountain ditch at an elevation of 9,250 feet. The estimated cost of completing the construction work proper is \$158,000 for the entirety. There are no  
791 tunnels but four very heavy pieces of side hill flume work of an aggregate length of between 1,400 and 1,500 feet. I will give you the total yardage in the various classifications. 156,000 yards of earth, 48,000 yards of loose rock, 35,000 yards of solid rock. The latter requires blasting, and probably  $\frac{1}{3}$  of the yardage under the loose rock classification will require the use of black powder under our specifications. The excavation work is on side hill slopes, varying up to 70 per cent slope. The average would be between 30 and 45 per cent transverse side slopes. The ditch completed will have capacity of 350 cubic feet per second. About 15 per cent is now completed, mostly about the center of the 7.8 miles of length.

792 The period for favorable construction work at that altitude is between June 1st and November 1st. Prior to June 1st there was too much snow and the ground is waterlogged and a spring under every rock and in September the winter snows begin. The ditch is situated near the face of the snowy range. Timber line is about 10,500 and this canal is at 9,250, or 1,250 feet below timber line. After the September snows begin the work gradually closes up. From there on up to the tops of these mountains it is the heaviest snow along the mountains of that section. We have had innumerable difficulties in connection with that work. In addition to the climatic conditions that have to be contended with, the coun-

try is hard of access any time of the year. Practically no roads that can be traveled with an ordinary load and team of horses. The contractor in there last year paid 25 cents per hundred for a haul of the last six miles from a shipping point on the Hahns Peak Railroad, station Albany, which is the closest railroad point. The first work I did on this Bell Supply canal No. 2 was in October, 1910. I made extensive surveys to determine the best preliminary line for that canal and I also ran the first preliminary line. In September, 1911, I made the final location, completing in December, 1911. We had snow in September and from September until I left in the first part of December, did not see the surface of the ground except when we got rid of the snow. I wanted to complete that location that year and there was a great many days in October and November when we located it with considerable snow falling and the thermometer sometimes as low as 15 or 20 degrees below zero. By "getting rid of the snow" I mean removing the snow. When I left that year the snow was between 2½ to 3 feet deep. That ditch is located  
 794 in part of the forest reserve and there is some very good timber in that section. We had to clear a right of way through the timber, some very heavy clearing. The right of way is all cleared at the present time except about one mile.

Since I have been here they have pushed that Douglas creek work along as rapidly as they could except this season. Comparing this work with a system of similar excavations and classifications of material in an open country, if the same kind of construction that is on Douglas creek was done, within 5 miles of the city of Laramie it could be done in about ¼ of the time. Also at very much less expense. Prices are very much higher on Douglas creek on all kinds of work than at Laramie. The contractor that bid on the Bell Supply Canal No. 2 also completed the North Canal for us last year. His earth price on the North Canal was 13 cents, on Douglas Creek it was 19 cents, a very good illustration of the relative cost. The contractor's opportunity for profit is very much less on the  
 795 Douglas system than on the North Canal, where the unforeseen happens continually up there. We have some rock work on North Canal. It is softer rock than on Douglas canal. The contract price on North Canal is 90 cents and on the Bell Supply Canal No. 2 is \$1.25 per cubic yard.

When this Bell Supply Canal No. 2 is completed its waters will be available for distribution to practically any part of the Laramie Water Company's system, through the Stewart canal or taken into Lake Hattie reservoir. If the Pioneer High Line is ever built there is a crossing over the Lake Hattie Supply No. 2 and the Pioneer High Line will be so constructed that Bell Supply No. 2 waters could be run in the Pioneer High Line from that point. There is an acreage of about 3 sections under the Pioneer High Line survey and above the point of intersection with the Lake Hattie Supply Canal No. 2 which enters the reservoir east of John Creek.  
 796 It follows a natural drainage channel. John creek runs in the spring only. There are a few springs on the east slope of Sheep Mountain in the vicinity of John Creek and Lake Hattie. The

Pioneer High Line survey was made for the purpose of serving land immediately north of Lake Hattie reservoir and all the land in Big Hollow and land on the south limb of Big Hollow, which is above the North Canal, and a portion of the land in Tp. 16 N., R. 74 W., above the North Canal which can be served either by the Pioneer High Line or the lower end of the Stewart canal. The land north of Lake Hattie and in Big Hollow is more sloping than the other land included within the irrigable area under the Stewart or North and South canals.

The Lincoln and Warren ditches are proposed canals in the vicinity of Fox Park, which, if constructed, would divert Lake creek and contributory drainage, Lincoln gulch creek and tributary drainage. Both creeks are tributaries of Douglas creek and Lincoln and Warren ditches collecting these waters would turn them across the divide into Squirrel creek, a tributary of Fox creek which is a tributary of Laramie river, entering between Wood's Landing and Pioneer canal headgate. I made only preliminary surveys of that ditch. Nothing further has been done.

The Interstate Reservoirs and Construction Company controlled the original filings and permits on the Little Laramie system, made, I believe, by Colonel E. J. Bell as applicant. The table of permits appearing on page 116 of the Biennial report of the State Engineer of Wyoming for 1907-8, and particularly permits Nos. 8518 to 8521, inclusive, by E. J. Bell, being for an appropriation from Little Laramie river and two appropriations from Douglas creek and tributaries and a second appropriation from the Little Laramie river, are a portion of the permits that were controlled by the Interstate Reservoirs and Irrigation Company. Permit 8518 covers Bell Supply

798 Canal No. 1, and has been absorbed in the permits for Lake Hattie Supply No. 2 and amended permits for the Stewart canal. The entire relation of these permits will be shown in the amended filings which were made last year for the Pioneer High Line and Lake Hattie High Line canal, which name is used for the Stewart canal, located and built at this time. Permit 8519 is the original permit for Bell Supply Canal No. 2. Permit 8520 is the original permit for Bell Supply canal No. 3. Later permit No. 8519 and 8520 were amended and absorbed in permit No. 2538, enlargement, which is the last permit for Bell Supply Canal No. 2, obtained in either January or February, 1912. The Interstate Reservoirs and Irrigation Company also had the Bell Reservoir No. 1 and Bell Reservoir No. 2 and made some filings in connection with that and a line to take care of land in Big Hollow, which line derived its supply of water from the Laramie river. Then they had filings on the Bath reservoir and inlet and outlet canals for the Bath. Very few, if any, of these filings, or permits have been discarded. They have all been amended or absorbed by the Laramie Water Company by combining the filings and permits of the two companies. The later

799 filings being taken out in the name of the Laramie Water Company. E. J. Bell was one of the moving elements in this Interstate company. Also R. D. Stewart and F. S. Wendelkin, who is now or recently has been secretary of the Laramie Water Company.

Also, I believe, F. C. Grable. I believe that G. S. Speer was associated prior to the formation of the Lake Hattie Reservoir and Irrigation Company. I think he was part of the ring connected with Trowbridge and Niver of Chicago.

The expenditure prior to December 1, 1910, I referred to, was by the Lake Hattie Reservoir and Irrigation Company. Up to that time the work of the Interstate Company had been primarily promotion and engineering. They had done some construction on the Bell Supply Canal No. 2, and some assessment work on the Stewart canal and Bell Reservoir No. 1 and Bell Canal No. 1. It was mostly 800 assessment work for the purpose of making a showing of tangible figures every year of money spent on construction.

The lower end of the Lake Hattie Supply Canal No. 2 was completed during June and July, 1911, and was done by making a small ditch and turning in the water down the slope through the ditch. The actual expenditure amounted to approximately \$3,000 in making the preliminary ditch. That preliminary ditch was about 1/10 of the capacity originally that it is now. In the \$34,000 yet to be expended on the Pioneer enlargement and Lake Hattie Supply Canal No. 1 is included repairs to be made to the controlling dykes at the head of the Pioneer enlargement. It is proposed to reconstruct 26 stations near the Sodergreen lake and to line that portion with a concrete lining. That portion runs principally through disintegrated shale. It is a clay formation. There are two concrete drops to be built on this same portion and it is expected to straighten the sluice section of Lake Hattie Supply Canal No. 1 and to put in protection structures in some of the curves that have been developed to prevent future wash in directions not desired. Then there are repairs to be made at the Sodergreen bifurcation works. In connection with the head of the sluice section of canal No. 1, it 801 is expected to build bifurcation works which will eventually be needed for the Pioneer High Line and combine the control structure to Lake Hattie Supply Canal No. 1 in this single bifurcation works.

If the lands on the slopes of Big Hollow were irrigated, the return or waste water would find its way down to the bottom of Big Hollow. There are several small lakes in the bottom of Big Hollow, but the size of these lakes is not great and it is probable that some per cent of the water in these lakes is finding its way to the big or Little Laramie rivers. A large portion of this water evaporated. A certain proportion of the return water from the North Canal is collected in depressions from the first 2/5 of the total length of the Canal. From Sections 10 and 11, Tp. 15, R. 74, all the return water would 802 find its way to the Laramie river. The Big Basin, situated between the two rivers and in part of the northwest of Tp. 16, R. 74, contains alkali lakes and has no natural outlet. Probably there exist well defined subterranean passages between this station and Little Laramie river, because the supply of water for these lakes is greater than the rate of evaporation, so the difference must be taken up by seepage from these lakes.

I have not made experiments to ascertain the rate of evaporation. We have plenty of wind. Change of air in contact with the surface



of water accelerates evaporation. The lake in the bottom of Big Basin is about 75 feet lower than either Little Laramie or Big Laramie rivers at their junction. The gradient of the traveling water plane, if any, from the lake in Big Basin, would reach the surface at a point below the junction of the two rivers. In the Little Laramie Valley the water plane is pretty close to the surface, probably 15 or possibly only 10 feet below the surface of the ground close to the stream north and east of the Big Basin on the Big Laramie river.

The Big Basin is where the water is being waste- now out of the end of North Canal. When we were running a large supply in North Canal two weeks ago at the time Mr. Goldsborough was here with a party from Chicago, the water went into Big Basin after it reached the lower end of the North Canal.

Cross-examination (cont'd).

By Mr. Fred Farrar:

The relation between the irrigation system of the Laramie Water Company and the Laramie-Overland Municipal District is that the company is building this system and the district is one of the  
804 districts that puts some of this system into use. The Laramie

Water Company is merely the company which owns the ditches and rights of way and expects to sell water at some stated price to people in the district or outside the district. The Goldsborough Construction Company a head contractor on this project. Their contract is with the Laramie Water Company which has a contract with the land owners through the district organization. The lands which the Laramie Water Company irrigates are not necessarily lands which they own. I believe the Laramie-Overland Municipal District is bonded, for the purpose of eventually taking over the assets of the Laramie Water Company; and that eventually this  
805 system of canals and reservoirs will become the property of the district. The Wyoming-Bell Municipal District lies immediately north of the Laramie-Overland District and its lands are also included in this Lake Hattie system.

The boundaries of the Wyoming-Bell Municipal District are not outlined on the map attached to the answer in this case and termed Exhibit A. The boundaries of the Laramie-Overland Municipal District are not correctly set forth on that map. It contains less acreage than the area shown on this map.

The Bath reservoir is a proposed reservoir. It is not completed. It lies at the upper end of big Basin, in Sections 10, 11, 12, 13, 14 and 15, Tp. 16 N., R. 75 W. and is not shown on said Exhibit A. Representations of small lakes in Sections 13, 14 and 15 in Tp. 16, N., R. 75 W. on Exhibit A indicate the location of the Bath reservoir site. Its superficial area, as planned, would be approximately 2,000 acres. If completed it will obtain its water supply from Little Laramie river and by means of another canal from the Stewart, neither of which are now built. The Stewart  
807 canal would get its water from the Little Laramie river.

OTT. L. BURNS, a witness in behalf of Complainant.

Direct examination by Mr. John D. Clark:

808 I lived 20 years nine miles south of Laramie on Five Mile Creek; in the ranching and cattle business; employed by Red Buttes Live Stock Company as General Manager. Have had charge of the irrigation of their ranch for 20 years. Five Mile  
809 Creek is a tributary of the Laramie and flows into the river five miles above the City of Laramie. Willow Creek is a tributary of Five Mile. The ranch is irrigated from Five Mile Creek and Willow Creek. I have never seen any water flowing in the Laramie River from Five Mile Creek. I have been familiar with the point of juncture. The water is used by appropriators for these lands.

810 The Red Buttes Company irrigates about 300 acres. One of the ditches is the Upidee. Have not used it much for two or three years because of scarcity of water. The ditch was built some time in the eighties; about a mile and a half long. There is also the Rice Ditch on that ranch, which was constructed in the seventies. All the ditches on the ranch were built before my time. The Upidee ditch irrigates 40 acres; Rice ditch has rights for 40 acres but  
811 don't get that much irrigated. Water has been short a number of years. The Homer Ditch on the ranch irrigates about 100 acres. The Democratic Ditch irrigates about 50 acres. There is irrigation on Five Mile Creek by means of dams in the bed of the stream which spread the water and it runs out and irrigates the land. These dams were there when I went there in 1893.

812 The whole of the irrigation from dams and ditches would not exceed 300 acres including the irrigation from Willow Creek. Sam Collins takes water from Five Mile Creek; also James McGibbon. Mr. Collins irrigates about 50 acres and McGibbon, or Willow Creek Ranch Company, 60 acres.

813 John Cook irrigates some land through a ditch taken from Willow Creek which was taken out ten years or more ago. The Willow Creek Ranch Company has several ditches through which it has irrigated about a section of land since the 70's. There have been years when they could get but a little water.

814 There are a few small tributaries to Five Mile and Willow Creeks but they flow only a small amount of water.

814 OTTO L. BURNS.

Cross-examination by Mr. Fred Farrar:

Five Mile Creek heads in Boulder ridge in Wyoming. I don't think any tributaries head in Colorado. Willow creek heads in Wyoming. These streams head south of Laramie about 20 or 22 miles. The creek which joins Willow creek I have designated Five Mile creek. It is termed Lone Tree creek on the topographic map of the U. S. Geological Survey for the Laramie Quadrangle (Edition of July, 1908). The headwaters of Willow creek are immediately north of the Colorado state line. Whether or not

815 Lone Tree creek heads in Colorado, its headwaters are joined

approximately a mile below the state line. These streams run in a general northerly direction. Unless diverted their water would flow into the Laramie river.

Cross-examination by Mr. Delph E. Carpenter:

The home ranch of the Willow Creek Ranch Company is about 3 miles southeast of Red Buttes station. The Red Buttes Land  
816 and Live Stock Company owns the Homer ranch. Those ditches which belong to the Red Buttes Company irrigate a part of the Homer ranch. The Red Buttes Company acquired the Lindsey ranch, or the Pap Rice ranch. The Anderson ranch, the Gilmore and Soul ranch. Its central or home ranch is the Homer ranch. The ditches belonging to the Red Buttes Company and also the dams in the creeks used to throw the water out over the meadows, were the ditches and dams belonging to these several ranches. That  
817 portion of the Red Buttes ranch now irrigated is used for making wild hay, native hay. These irrigated lands lie near the creek and really constitute a part of the creek bottom. As the water comes down through Willow or Lone Tree creek and strikes any of these diversion dams it is taken out and placed over the meadows. It then flows back into the creek and is taken out again. That is repeated on down through the creek valley. That portion of the creek valley that is irrigated is about half a mile wide at the widest place we were irrigating. It would narrow down to the creek bank at other places. In some places there are no meadows along it.

In ordinary years we cut on the irrigated land of the Red Buttes Company from 200 to 300 tons of hay. It is fed to cattle during the winter.

The Red Buttes Company controls under fence about 14,000 acres of land, I never knew exactly the number of acres. We run our stock altogether in pastures. One year with another we run  
818 from 500 to 600 head of cattle during the summer. We run about 60 head of horses during the summer and carry over about 30 head during the winter. We do not run sheep. During the 20 years I have been in charge of this ranch it has been a cattle and horse ranch. Of late years we have been holding everything under fence. In the *yearly* '90's we had more cattle when there was free range and ran the cattle in the summer on the range and under fence in the winter. Since 1900 we have run everything under fence and had to cut the herd down.

Sam Collins on his Brush Creek ranch runs 60 to 100 head of cattle. Brush Creek enters Five Mile creek on Willow creek ranch. Sam Collins cultivates wild or native hay.

The ranch of John Cook is just above the Willow Creek Ranch Company. He runs about 60 head. James Van Buskirk owns a ranch between the Homer ranch and the mouth of the creek at the Laramie river. He irrigates near 50 acres of native hay on Five Mile. A strip of land on both sides of the creek. It is irrigated to native hay. He sells his hay. Willow creek, as well as Five Mile and Lone Tree creek, are all fed by springs. The springs rise at the

heads of the various little tributaries. The creeks flow constantly 2 or 3 weeks in the spring. If the snow is heavy in the mountains there is a good deal of water. Other years when there is not much snow the flow is very small. I never followed down the Five Mile creek to see whether or not water entered the Laramie river, but for a great many years in my time there has never been water only a short distance below the Homer house. What little there was was absorbed by the meadows. During the last 2 or 3 years we have been shorter of water than in previous years. The first year of shortage was in 1910, 1911 was short, and there was a little bit more in 1912. 1913 was short the same, that was this year. It has just a fair average run. Van Buskirk's appropriation is junior to ours. If there is any water left after the Red Buttes Company gets through with it, Van Buskirk gets it. If any passes Van Buskirk that goes on to the river.

Sportsman's Lake is about the south boundary of the big pastures of the Red Buttes Company. That lake is in Sections 1 and 2, Tp. 13 N., R. 74 W. The country south of Sportsman's Lake is used for pasture. The country east from the Homer ranch and toward the Sherman mountains is used for grazing.

#### R. I. MEEKER.

Direct examination by Mr. John D. Clark:

823 I have two tabulations prepared, asked for at my prior examination, viz., the gauge heights and discharges of Fox Creek for 1912 at its mouth; also the daily mean discharges of the Pioneer Canal Enlargement near Woods, Wyoming, for the year 1912. (The papers handed to counsel for defendants.) I am familiar with Pioneer Canal.

824 I examined lands lying under Pioneer Canal on August 4 and 5 and September 18, 19 and 20, 1913, and ascertained acreage for that year. In securing acreages which were irrigated from Pioneer Canal, a Government topographic sheet was used as a base map. Each section was inspected by driving along the country roads and making side trips on foot across portions of sections to determine various crops and areas irrigated. Lines were located largely by subdivision fences, also by contours, ditches and other cultural features. Different tracts were ascertained where necessary by pacing off distances and widths of various fields and by estimating proportion of a quarter section or the area in question. Total area of land irrigated from Pioneer Canal in 1913 is 11,486 acres.

825 The lands were used for meadow, irrigated pasture, oats, alfalfa and miscellaneous crops, including potatoes, barley, wheat and garden truck. I have been familiar with the Pioneer Canal sixteen months. A considerable area of lands have been irrigated under that canal in prior years, as shown by the tilled soil and laterals. These are not included in the acreage above stated. The irrigated meadow in 1913 is 5,398. Irrigated pasture 2,061 acres;

oats, 2,115 acres; alfalfa 1,740 acres; miscellaneous crops 172 acres.

826 From the North Canal from Lake Hattie Reservoir there were irrigated in 1913, 705 acres, namely oats 48 acres, alfalfa 20 acres, irrigated pasture 637 acres. Examination of same character as of lands under Pioneer Canal and on same days, September 18 and 20. The tables produced by the witness were marked Exhibits 14 and 15.

827 R. I. MEEKER.

Cross-examination by Mr. Fred Farrar:

This examination of the land under the Pioneer canal occupied five days. It was done without an instrument. By inspection, blocking out and pacing off distances to determine boundary lines from cultivated features, ditch lines, etc. The general line of the Pioneer canal is parallel to the river. There is a main traveled highway which is likewise parallel. I traveled over that highway and all the adjoining ones. I was on portions of every section away from the road. I used an auto and where there were roads I drove in and drove over large portions of the lands where they were unirrigated to get at the irrigated portion. Where the car could not go I got out and covered that on foot. I used no instrument. My measurements were made by pacing.

828 I found evidence of other lines than the ones included in my given area which had been previously irrigated, but not now irrigated. I made no determination of these. There was a considerable acreage, more than 2,000 acres. It was in excess of that, but I don't care to state because I don't know. These lands were scattered throughout the irrigated area. That canal is about 30 miles in length. The irrigated area under the canal varies in width from 3 to 3½ miles. I did not make a map showing

829 the summation of this work, I have my field notes. I found 5,398 acres in meadow. It had been cut or was being cut on that area during 1913. In the early part of this examination in August some of the land was uncut at the time but it was land where the hay is cut each year. I worked from the upper end down, starting at Sodergreen Lake. I found 2,061 acres which I classified as irrigated pasture land. I found 2,115 acres of oats, during the latter part of the examination in September most of them were cut. Some of the oats were in each township, more or less scattered throughout the section. Those harvested were cut and

830 shocked. The alfalfa had been harvested on the area which I described, chiefly so. That would be the second cutting. Very little alfalfa remained uncut in September. The uncut part lay on the Heart ranch. They were cutting alfalfa on the Heart ranch on the 18th of September. I saw them cutting other places during September. The alfalfa harvest was generally finished about that time.

Of the 172 acres of miscellaneous crops were included potatoes, barley, wheat and garden truck.

831 There were approximately 20 acres of potatoes. They had not been dug. I think none of the oats which I saw had been threshed. I don't recall any. I did not see any threshing machines working. In August the potato vines were well advanced, in September they had been largely killed by frost. They were in good condition in August. I do not remember of any evidence of frost. There was a heavy frost about the 29th of July. I observed the potatoes on the agricultural experiment station that adjoins Laramie immediately after the frost. Where they had been irrigated recently they were frosted considerably; where they had not, it did not affect them so much.

832 There was very little wheat in the 172 acres which I classified as miscellaneous. I do not know the reason. Last year there was very much more. There was more barley raised last year than this. There were 42 acres in this total 172 acres

833 that I have given. I do not know the reason for the decrease in the barley area. There were 15 acres of bearded wheat in Sec. 17. There was approximately 5 acres of millet. I made no segregation of the wheat on the University Experiment Farm. There was some wheat grown there for experiment purposes. The University Farm is a general experiment farm.

I will give you the location of the oats: 112 acres, 45 acres, 60 acres, 75 acres, 22 acres and 50 acres, 20 acre, 15 acres, 115 acres 75 acres, 70 acres, 80 acres, 20 acres, 41 acres, 145 acres, 50 acres, 45 acres, 120 acres, 60 acres, 50 acres, 40 acres, 53 acres, 65 acres, 185 acres, 40 acres, 50 acres, 40 acres, 32 acres, 20 acres, 47 acres, 40 acres, 16 acres, 93 acres, 63 acres.

834 On the Experiment Farm the oats and peas had been planted together. They were cut for feed. That includes all the oats under the Pioneer canal. I do not believe that any of this 11,488 acres which I have given are irrigated from any other than the Pioneer canal.

I will give the location of the alfalfa: 9 acres, 5 acres, 15 acres, 40 acres, 25 acres, 68 acres, 52 acres, 87 acres, 20 acres, 104 acres 130 acres, 50 acres, 6 acres, 271 acres, 167 acres, 116 acres, 32 acres, 40 acres, 150 acres, 30 acres, 65 acres, 30 acres, 196 acres in several blocks.

In some instances there were evidences of cereals having been raised upon the lands which I mentioned as not having been  
836 irrigated this year. There were large areas of pasture which had been irrigated formerly but which was not irrigated this year, and some meadow. I believe some very small areas of alfalfa. In Sec. 31 I recall a considerable area that had been in alfalfa. Under the north canal I found 637 acres of raw land upon which water had been applied this year. It was just raw prairie land. It was located mostly in Tp. 16, R. 74 W.

837 I consider the irrigation of prairie land an economical use of the water because it is a branch of stock raising in this community. I would not say that the returns are justified in comparison with the returns from cultivated lands. A certain amount of pasturage is essential for fall use before the feeding of the gen-



eral hay crop commences and is customary in this country. I would not say that they would get a greater return from the result of irrigation for pasturage than they would if they raised that much alfalfa, wheat, or oats. I would not care to make the statement that the actual return in value from the irrigation of prairie lands is nominal. I give it as my observation. I state it to be a fact.

At the present time this district is primarily a stock country.

838 Cross-examination (cont'd).

By Mr. Delph E. Carpenter:

In estimating the 5,398 acres of meadow land under the Pioneer canal I included the land that is wet from year to year by seepage from the Pioneer canal, where they cut hay. There are approximately 1,005 acres of seepage hay land under the Pioneer canal.

I found in Sec. 15, Tp. 14, R. 76 90 acres which should be credited to seepage from the Pioneer canal. That would make a total of 1,095 acres irrigated by seepage.

The remaining 4,303 acres of native hay were irrigated directly from the Pioneer canal.

841 160 acres situate in Tp. 15, N., R. 75 W. of the land designated as irrigated pasture land are irrigated by seepage.

Referring to the acreage which had evidently been irrigated at one time and which had been allowed to go without irrigation or cultivation this year, I could not state principally where it is located other than various parts of the entire irrigated stretch from one end to the other. Some years under the Pioneer canal tracts lie idle because the land owners did not buy water for it. My experience with the Pioneer canal and this section has only extended over 18 months. I have given the land by me ascertained as irrigated under the Pioneer canal, whether irrigated directly, by seepage, or overflow, as it appeared when making my observations in August and September, 1913.

The total acreage of irrigable land under the Pioneer canal is much larger than the area which I have given as irrigated. It is more than 2 or 3 times as large as the irrigated area. I do not say that 13,000 acres represent the total development under that canal since its construction. If there were 19,000 acres irrigated in the past, that would make about 7,000 or 8,000 acres that have gone back to unirrigated lands since that time. 11,486 acres represent all of the land irrigated in 1913. There were no more lands than those that I know of. I went over this land in company with

843 E. D. Titus. He is the best posted man in the Laramie river valley as to what lands have been irrigated under this canal.

I ascertained the acreage and he assisted me in getting around over the country. He pointed out the areas and gave me the names of the owners. I measured the tracts myself. I determined from inspection whether or not the tracts were irrigated directly from the ditch or by seepage or overflow. The E. D. Titus who accompanied me is the same who has previously testified in this case. I was too

much engrossed with the problem in hand to make any estimate of the area which had returned to aridity.

844

LARAMIE, WYOMING, September 23, 1913.

(By the witness:) Before Mr. Carpenter commences his cross-examination I would like to make one correction, referring to Sec. 18, Tp. 16 N., R. 73 W. I gave 130 acres of irrigated meadow by Ryan Brothers. I wish to change that to 210 acres. That would necessarily modify the totals. The total irrigated meadow in all was given as 5,398 acres and the 80 acres would — it 5,478 acres. This increases the 11,486 by 80 acres, making a total of 11,556 acres.

Cross-examination by Mr. Delph E. Carpenter:

In giving the acreage in alfalfa I included the area in Sec. 1, Tp. 15, R. 74 which was newly seeded. I gave 104 acres in Sec. 11, Tp. 15, R. 74. Newly seeded and not producing sufficient alfalfa for cutting this year. The 130 acres of alfalfa in  
845 Sec. 14 is not large. Some of that alfalfa has not received very good attention this year. The southeast quarter is in native meadow of rather poor quality. In irrigated pasture and meadow. Nearly all of the northeast quarter, not including the alfalfa, is in the same condition. It has been irrigated in previous years. Some of that lies under the Walcott Ditch. There  
846 was considerable hay cut off the north forties last year. In giving the number of acres on Sec. 31, Tp. 16, R. 73, I included newly seeded ground in my alfalfa acreage, about 30 acres. There is land that I classed irrigation pasture and some that I classed as "no crop." The no crop land is old plowed land. It has stubble on it, and also some alfalfa. In the southeast quarter of the northeast quarter of that section there is a pond. I classified the land surrounding that pond as irrigated pasture. In much of the irrigated pasture land described in other sections there was fox  
847 tail. Land is not usually exceedingly wet where fox tail appears. If you get too much water it would kill it. Fox tail appears where the land is damp. Referring to Sec. 19, Tp. 15, R. 74, I gave 80 acres of irrigated meadow land belonging to Mr. Grable. Part of this land that I have classed as irrigated meadow is covered by small ponds. The grass land lies around the ponds. It covers several acres. The 40 acres of irrigated meadow credited to sec. 29, Tp. 15, R. 74 is irrigated land. I class it as poor meadow. Hay was cut from portions this year. On the north side of the county road on that section there is a large lake. I didn't include anything north of county road. Seven Mile lake is like the pond on Sec. 17, filled by waste seepage water. 40 acres of irrigated meadow should be in Sec. 24, Tp. 16, R. 74, instead of Sec. 36. It is situated under the Pioneer canal where the canal loops around a  
draw and is used for meadow and pasture. I credited 379  
849 acres of irrigated meadow to Sec. 17, Tp. 16 N., R. 73 W. I didn't observe any pasture land there. I included the

southwest quarter as irrigated meadow; also practically all south half of northwest quarter; I drove and walked over most of it and don't recall that it is too high to irrigate. There were some portions a little rough and the hay had not been cut this year, but left to be fed. I would not state that a portion would not be strictly hay meadow. Some of it is a little uneven.

850 The lands under the North canal, the north branch of Lake Hattie outlet were brought under cultivation and irrigation first in 1913, the first year water has ever run through the canal. None of the 637 acres under that development would properly be included under the original Pioneer development.

I didn't know that the Laramie Water Company has been running the north canal full of water and wasting it into Big Basin. There has not been a large canal full of water, referring to the discharge. Several dams have been put in the North canal just below spillways, whereby the water was raised sufficiently for forcing it out over the spillways for irrigation.

Some water has been running out at the lower end which has been used for irrigation. Some has been running almost constantly into Big Basin for weeks. No large volume because a large volume has not been turned down the canal. The water running into Big Basin is lost forever for irrigation. That basin is about 100 feet lower than the rivers at their junction. It is distinguished from another large basin lying generally to the south, called Big Hollow.

851 The irrigation of the old Pioneer canal is taken from reports by engineers on that canal and its proposed extension and enlargement, documents of the Laramie Water Company. I know of the various permits under which the new development of the Laramie Water Company has progressed and which was authorized by Wyoming. The Laramie Water Company is a corporation operating under the laws of Wyoming, formed sometime in 1910. I am unable to affirm that its by-laws were adopted August 24, 1910, or thereabouts. The company was formed as a result of

852 agreement of consolidation between Lake Hattie Reservoir and Irrigation Company and the Interstate Reservoirs Construction Company and the interests of E. J. Bell, F. S. Wendelkin, F. C. Grable and R. D. Stewart. I am not familiar with the agreement. I may have seen the agreement on or about the 5th day of May, 1910, whereby they agreed to form a consolidation, but do not recall having read it. These two corporations and private individuals had various interests which were merged into the Laramie Water Company.

The total acreage irrigable under the Pioneer canal, not that irrigated, is approximately 49,000 acres. That included the Pioneer High Line. I could not give the acreage excluding the Pioneer High Line. I would not state that the High Line Canal is new. The Pioneer High Line canal has not been built yet. Surveys and reports have been made on the Pioneer High Line, dating  
853 back as far as 1889, at various times for the Pioneer canal and for the Laramie Water Company. It is more than a

matter of reports and mere lines of survey. Rights of way have been secured for it but I am not able to state very recently. I have no theory that it is an old canal, simply knowledge and observation. I cannot give the acreage under the Pioneer as actually constructed and operated.

Cross-examination by Mr. Fred Farrar:

49,000 acres includes portions of land under North canal and South Canal. The Fischer Ditch, Walcott Ditch and the Last Chance Ditch have since been constructed and cover areas embraced in the total. None of these save perhaps the Walcott ditch, 854 which covers a very small area, are earlier than the Pioneer.

The 49,000 acres approximate covers land adjacent to the Pioneer without regard to the present new construction, of the Lake Hattie system. If the new construction did not exist the position and location of the Pioneer is such that by laterals and extensions it would cover that acreage. The irrigation of that acreage does not necessarily pre-suppose a supply of water from Lake Hattie. By enlargement of the Pioneer and construction of laterals it would be rendered capable of serving 40,000 acres. It is not the policy of the Laramie Water Company to prevent construction of ditches or reservoirs by individual land owners or companies which would irrigate the area capable of service from the Pioneer. I know of no instances where they have endeavored to block individual projects or prevent the construction of other projects. The Laramie

855 Water Company is a service company, carrying water for compensation, and supplying water for perpetual water rights. There is an annual charge for those not having a perpetual water right. I do not know about charges to those having perpetual water rights. The construction of a ditch or reservoir designed to irrigate lands under but not irrigated by the Pioneer would deprive the Laramie Water Company of a contemplated source of revenue if priority rights were to go with that construction. It has not been the policy of the Laramie Water Company to monopolize irrigation possibilities upon all lands lying under the canal, and Lake Hattie and its subsidiary projects, but to bring under beneficial irrigation; nor to force small ditches into the organization and the consequent abandonment of their own projects. I do not know of it ever having been done. The president of the Laramie Water Company

856 is not a resident of Wyoming but of Pennsylvania and is the treasurer, G. C. Graeber. The present general manager, Mr. C. C. Schrontz, is from Colorado. The Goldsborough Company, engineers for the Laramie Water Company, have not been connected with the Laramie Water Company since September 15, 1913, and are not now. I cannot give a correct list of companies and 857 individuals that during the last five years have been included in various schemes entering as factors in the present development of the Laramie Water Company; I only know the present company, the Laramie Water Company, the Arnold Company and the Goldsborough Company, both engineers for the Laramie Water

Company; the Goldsborough Construction Company, contracts for the Laramie Company; the Laramie Farms Company and the Goldsborough Land Company. The Interstate Reservoir Company, the Lake Hattie Reservoir Company, Francis C. Grable. F. C. Wendelkin, E. J. Bell, I don't know about Bell Reservoir Company. These have been factors or successors in interest in promotion of various schemes which have been consolidated into the Laramie Water Company. Coupled with those are the two municipal irrigation districts, the Laramie-Overland and the Wyoming-Bell. I have no knowledge whether the Laramie Development Company and the Laramie Realty Company are included in the promotion of these enterprises.

E. D. TITUS.

Direct examination by Mr. Clark:

858 I have been superintendent of the Pioneer Canal for fourteen or fifteen years.

859 Have had entire supervision over the distribution of the water, giving to it all my time through the entire year. The irrigation season under the Pioneer Canal is from some time in April until the latter part of September. During that period the water runs constantly through the canal to its full safe capacity. Became acquainted with the canal in June, 1888, and have been familiar with it ever since. I had a homestead in Section 22, Township 15, Range 74 in 1888 under the Pioneer Canal. I had a knowledge of the canal from '76 until the latter part of '78. They were then starting the construction of what was then called the Crout or Hutton Ditch.

860 I was out of the county from '78 to '88. When I returned in '88 the Pioneer Canal had been completed and is now as it was then with few changes. In Section 24, Township 75, the ditch was changed for about a quarter of a mile in width. There has been no extension of the canal in length. From the head works about  $\frac{2}{3}$  of the way down to the Sodergreen lake there has been an enlargement. That is about two miles in length and the enlargement was made when the Lake Hattie work was being done. No other enlargement has been made since 1888.

861 Quite a large acreage was being irrigated under the canal in 1888. There were from 50 to 60 people under the canal. Today there are probably 250 people living under the canal, or more.

862 There are seventy different headgates distributing water to users and there are only two or three of these that are partnership laterals. I have kept tab at all times on the amount of water carried in the canal, have a measuring weir about 175 yards below the headgate at the river. Prior to the Lake Hattie enlargement the canal carried over 200 second feet of water, at times as high as 240 or 250 second feet. That would be in the latter part of June and the very first part of July.

863 At times I ran as low as fifty second feet during August, seldom less than that. The water is diverted from the river by means of a dam and headgate. I accompanied Mr. Meeker when he examined the lands under the Pioneer Canal. I know the lands which he ascertained to be irrigated in 1913. Additional lands have been irrigated from the canal in other years, amounting to several sections of land. In 1912 we irrigated 19,000 or 20,000 acres of land under the canal. That is the greatest amount ever irrigated from it. The same amount was irrigated in 1911 and 1910.

864 Ten or twelve years ago I made a map marked Exhibit 7 in the proceeding in the District Court of Laramie County adjudicating the rights of appropriation on the Laramie River. The acreage irrigated then was something like 17,000 or 18,000 acres. The same land was irrigated in every succeeding year up to and including 1912, with the exception of one or two instances where people allowed pieces of land to lie idle on account of seeding to alfalfa and didn't use the water on it.

E. D. TITUS.

865 Cross-examination by Mr. Fred Farrar:

To find the average size of the present ranches irrigated by the Pioneer, strike an average between 160 acres and 8 or 10 sections. 160 acres would probably be the smallest and about 4 or 5 sections the largest.

Cross-examination by Mr. Delph E. Carpenter:

The total acreage irrigable from the Pioneer is from 35,000 to 50,000 acres. The canal since 1888 is 38 or 39 miles in length. I have had water started in it before the 15th of April and running to the rear end and have run water into December. We have been prevented from running until in May in some years. The demand by users regulates the time of beginning. In April they irrigated hay and meadow land. Snow was then still in the ditches at points, at the upper, next to river where there were many willows and trees, and snow had drifted. Sometimes a would turn a small head of water into the ditch and force the through. In these early months we would not run the ditch entirely full, because there wasn't as great a demand as when they were irrigating grain. Late June was when I generally made the heaviest run and early July. They irrigated native hay with cold water in April and May and waited until June and July to irrigate grain, which did not need irrigating. They do not generally irrigate grain until it is large enough to shade the ground, probably 6 inches in height, which it would be then. In May all settlers want water for native hay meadow lands. I shut off irrigating native hay meadows the very last of June but generally they ask to have water shut off from July 15th to 20th. They keep water running on the meadows from the time I turn it on until they shut it off. After that I do not run a large head of water, because



there is no demand, but I keep running water into December for domestic and stock use. Probably half the cattle that were ranging along the ditch that belonged to different people, milch cows and horses and people drank from this same ditch. They prefer the ditch water in the summer time to their well water as there is less alkali.

After they have ceased irrigating I would run as low as 50 second feet or 60, enough to carry through to the lower end,—for watering these cattle and people. Very little water went back to the river or into the numerous lakes. In cases of storm we were protected

868 by two waste ditches to take care of the flood, and I always aimed to control the ditch so very little water went to waste.

The people and stock and seepage and evaporation consumed this 50 second feet running constantly. There was quite a considerable loss of revenue from seepage and evaporation. The settlers got the benefit of the seep water. The ditch seeped very badly in places. The seepage water ran out under and irrigated their meadows. Quite an acreage under the canal has been irrigated with a small flow of water from the canal. Of this 50 cubic feet of water per second, there would be hardly 15 per cent lost by seepage and evaporation. Evaporation is much less the latter part and the early part of the season than in summer, seepage is a great deal less in the latter part than in the fore part. These settlers raise 2,000 head of cattle

869 along the ditch which we water. Only one or two consumers paid especially for that service, two or three years when he was running sheep. He leased land there but owned quite a bit

of land over in north. He was there a good many years with his sheep but did not continuously lease water for his sheep. We furnished water for the stock to practically all the farmers along the ditch. The rest of the water they used for irrigation during the season. The Laramie Stockyards Company, one of the largest users, are using water at present time and will as long as we have water running in the canal for watering stock that passes through here in shipment. The pasture is across the river in Sections 19, 20 and 30, and none of the land is more than a mile and a half from the river.

There was quite a considerable "holler" the other day because 870 I had to shut down the canal for repairs. The river is not a safe place to water sheep when they are just unloading.

They crowd in and drown. There is not quite a flow of water in the river in August and September, this time of the year there is not as much as there is at this present time generally. 50 cubic feet of water, running constantly, would fill quite a lake in a short time. This 50 feet evaporates, seeps and is used, because I have never allowed until now over 2 second feet to go down at the lower end waste ditch, and I always keep waste ditch No. 1 gates shut, except in case of storm, or where I get a little too much water in, and I telephone them to shut off so much and open the gate in the meantime, and in about 12 or 15 hours the flow goes down and the gate goes down. Hard to say how much water cattle and people consume. We don't keep tab or charge for domestic use only in a few instances. Water is turned out only in laterals where people live away from the ditch,

enough to reach their buildings, or where they wished to use this water. There are more than a half dozen of them. The Stockyards Company run out their water into laterals for watering sheep but the sheep do not consume it all. What is not being used by the sheep is going back into the river. I never saw water cease flowing in the river near where these sheep are all the time. This flow of 50 feet through August and September, and sometimes as late as December, is largely for accommodation, supplying water to Pioneer patrons for domestic use. A portion seeps away and soaks in the ground along the Pioneer and the lands thereunder. Many are irrigating their alfalfa after they cut the last crop, the last two or three years, and find it very beneficial. That is in September, just before the ground freezes. It was demonstrated many years ago at the University farm that alfalfa could be grown successfully. The first alfalfa I ever saw growing was in Sec. 1 of the University farm, in this section of the country.

There are around 250 or a few more people, men, women and children, living under the Pioneer canal. That population would be distributed among more than 50 ranches.

I have to keep track of this water flowing into my canal all the time in order to properly operate the canal. I kept a record in 1906 or 1907, but I keep no record now.

#### Cross-examination (cont'd).

By Mr. Fred Farrar:

I devoted all my time to work as superintendent of the Pioneer canal. I am also president of the Laramie-Overland Municipal District and have been since organization, about three years ago. A portion of my time has been devoted to that.

The Pioneer canal is now owned by the Shamokin people. They are known as the Laramie Water Company. The business of the Pioneer is kept separate from the Laramie Water Company accounts. I don't know whether the Laramie Water Company has a 99 year lease on the Pioneer. I understood it was purchased outright. The

Pioneer canal was owned by the corporation called The Pioneer Canal Company. I could not tell where the stock of that corporation is held now. The Laramie Water Company owns Lake Hattie, through the Lake Hattie Reservoirs and Irrigation Company and not directly. I am in no way connected with the Wyoming-Bell Municipal District. Mr. Bath or Mr. Spaulding is the president of that district. The Laramie-Overland Municipal District was organized for the purpose of getting the lands under irrigation in the district by water furnished by the Reservoir Company. There is no connection between the Laramie-Overland Municipal District and the Pioneer Canal, apart from Lake Hattie. The relationship exists between the Laramie-Overland District through the Laramie Water Company with Lake Hattie and the Lake Hattie project. The Laramie Water Company owns the North and South canals leading from Lake Hattie.

875 The lands were petitioned into the district and a water right granted for whatever amount of land they put into the district. These lands are bonded and the owner owns that much stock in the water company. That covers his land. He is not then required to pay an annual toll or any other tax or assessment for water, he is only required to pay a certain amount for operation and maintenance charges. There are lands within the exterior boundaries of the district which do not form a part of the district. The Laramie Water Company furnishes water to the Pioneer Canal for all the lands under it, and it has furnished water this year for some land under the North canal. The lands under the Pioneer pay a yearly stipulated price for the water which they get from the Laramie Water Company. That price is supposed to be on the amount of land irrigated. Those contracts are just for one irrigation season. They furnish not less than one cubic foot of water per second of time for 70 acres for one dollar per acre. If they get more it is simply turned out to them. Some few in times past have gotten a good deal more than they paid for. I don't think any have received more for that amount for the year 1913, because we have not had the water to deliver when it was called for. Some received more in 1912 and '11. In the fore part of 1910 they did but in the after part of the season they did not. Nearly all of the ranches received more water than one cubic foot for every 70 acres during the irrigation season which they paid for.

876 I have studied perpetual rights under the Pioneer system and I haven't made up my mind whether or not we have such rights. We have sold shares in the Pioneer canal to  
877 different ones which makes them a part of the Pioneer canal company. The matter of perpetual rights is tied up in a pretty complicated shape. I would consider a perpetual right would be where a man would have a perpetual right to water without any further charge. Some of the small users in Sec. 31, Tp. 16, R. 74 claim they have, but we have never acknowledged anything of the kind. I cannot figure upon what they base

878 their claims. They were rights sold to purchase water and then there were rights sold which would make them a stockholder of the company, just the same as if you or I would purchase stock in a company. They claimed they were perpetual water rights and they didn't have to pay anything more. It is a contention based upon the legal status rather than upon the physical. We have three classes of irrigators within the outer boundaries of the Laramie-Overland Municipal District: First, the appropriators under the original Pioneer canal, second, the owners of land forming a part of the district and receiving water from Lake Hattie and its projects; and a third, owners of land who are dependent entirely upon the purchase of water from year to year. In addition we have

879 one or more persons asserting that they have a free perpetual water right. Nearly all the old appropriators under the Pioneer may also be in the district. Whether in or out, if necessary to furnish them with water from Lake Hattie it is furnished. If they are out they have to buy it.

The contract between the Laramie Water Company and the Laramie-Overland Municipal District, of which I am president, is a contract to furnish water from their system of ditches for all time. The last lands signed into the district went in at \$25 per acre. Any payment made is not made by the district as

880 a whole but by the individual owner. The corporation has paid for water rights or physical property. There has been a payment in the Bell District with bonds for the district. The water company receives these bonds at 95 per cent of their face value in payment for water rights. These bonds are figured on an acreage basis throughout the district. There has been one payment of bonds made in the Wyoming-Bell Municipal District. The payment for water rights by the bonds of the Laramie-Overland District was taken up at our last meeting, but whether it has gone through I will not know until after we have another meeting. If it does go through, for a certain number of years this reservoir and ditches will remain in the company and after that will pass to owners of the land. If

the Laramie Water Company does not receive these bonds  
881 the reservoir and ditches will still be property of Water Company. There is an agreement for them to pass to district. Land that is petitioned into district and accepted becomes part of the district, and is bonded, and there is an agreement between the company and the district that they are to receive these bonds, charging a certain price for the water. After 50 or 49 years the Physical properties pass to the district. During this period a certain revenue is derived by the company from the lands in the district in addition to the interest and principal on the bonds, until the principal becomes due. That constitutes the profit which the company makes in the transaction above the difference between cost of building, payment for physical properties and expense of operation and maintenance.

882 The agreement between company and district is reduced to one contract. I think the secretary has one.

The general situation between the two districts and the Water Company is the same, but the Pioneer is different from the district. The original Pioneer ditch has practically the same status in both districts and the appropriators under it have practically the same. I have been superintendent of the Pioneer canal company ever since I have been in their employ. I don't know who is president of that

company now but think he is an officer of the Laramie Water  
883 Company. Mr. Schrontz is general manager of the interests of the Water Company and the Pioneer Company. My relationship is somewhat intermediary. I am an officer of the Pioneer canal company, which company is under the control of the Laramie Water Company, and I am also president of the Laramie-Overland District, which is in contractual relations with the Laramie Water Company.

The town of Laramie receives its water supply from springs to the east of the town.

## Cross-examination.

By Mr. Delph E. Carpenter:

The Pioneer canal company owned the Pioneer canal in 1888. Some water users were owners of stock, but the majority were not.

Under the territorial laws they asked for an appropriation  
884 to cover these lands lying under the Pioneer canal. The corporation got the appropriation. The land owners paid so much per acre per year to receive water. In years gone past it was 50 cents. A year ago last December notices were sent out of an increase to one dollar per acre per year. I do not know whether that was under the new organization or the Lake Hattie and kindred promotions. I got my instructions from the Assistant General Manager and sent out the notices. During the '90's, when I was running this canal for the corporation, the land owner who wanted water paid 50 cents an acre to us. At the time I took charge of the Pioneer canal in the '90s, the gross receipts was \$410 a year. The president of the company told me "make this canal pay expenses if you can't do any better." I had nothing to do with operation of canal in the '80's. So I proceeded to deliver water to the different users. Some of them were poor people just settled on their land. For instance, a man would pay for water sufficient to irrigate 30 acres, a cubic foot per second of time for 80 acres, and I would turn out to him double and sometimes treble that amount of water, and he had no money to pay for it, but had land to put it on. In that way I put them on their feet so that in after years they could come a whole lot nearer paying for the water they had used. I more than doubled the \$410 the next year after I took charge, I was told that in several years prior to my taking hold of it the consumers did not pay enough money to run the canal. The third year after I took charge the receipts took care of operating, but the ditch was in very bad shape at the lower end and the company had to put up its own money to repair it. The sixth year it a little more than paid operation and maintenance expenses. My theory of making the

canal pay its operation on maintenance expenses was to irri-  
886 gate the lands regardless of whether the parties paid for the amount of land they irrigated or not, for the reason that if land was irrigated for a couple of years they could put up a fair crop of native hay. Some of them put up hay the second year. The canal did not ever pay cash dividends to its stockholders prior to the initiation and promotion of the Lake Hattie scheme. It was always a problem for me to make maintenance and operation come within revenue derived from charges to water consumers. Since the organization of the Laramie-Overland District there are two different propositions whereby the water may be delivered to the land owners. No part of the Pioneer has been petitioned into the district.

887 When I was superintendent I did not keep a weir at the head of the canal all of the time. I placed the weir in there and it was used as a gauge until the Pioneer was enlarged and we have gauged since with a meter. That enlargement has taken place in very recent years. From time to time prior to the enlargement I com-

puted the amount of water passing over the weir by what is known as the California weir measurement rule. It was a drop weir having 3 feet. The weir crest was 3 feet above the bottom of the ditch. When we were drawing as high as 200 second feet it always showed  
 888 an air bubble along the crest of the weir so it showed it was running free. The water was decreased or increased in depth as I ordered. There was no official except myself in charge.

During these years, until the last couple of years, our diversion was never interfered with by the water commissioner, the state engineer or officials of the state. The interference has been since the enlargement of the canal and the beginning of storage of water in Lake Hattie.

JAMES HARDMAN, a witness in behalf of Complainant.

Direct examination by Mr. Clark:

889 My name is James Hardman. I reside in Laramie City. Was engaged in ranching on Sand Creek, Section 2, Township 13, Range 75, for thirty years, commencing in 1877. Knew the ranches on Sand Creek and the irrigation from that stream. It is a tributary to Hutton Lake. Prior to irrigation on that stream some years the water would run into the Laramie river and some years it would not. That was true when I first commenced ranching there.

890 It has been the same way since. In 1878, 1881, 1887, 1903 and 1908 or 1909, were the only years that any water flowed from Sand Creek into the river. I had two ditches taking water from Sand Creek. Other ranchmen irrigating on that stream were Mr. Collins, Mr. Lindquist, Mr. Goetz, Davis Brothers, Hoge, Cunningham and Wyoming Central Land and Improvement Company. I had Davis Ditch No. 2 which was built in 1878. It irrigated about 170 acres.

891 In the eighties I built the Alice Hardman Ditch, which was enlarged in the nineties. 400 acres were irrigated from that ditch, 300 acres of it prior to 1900. From Davis Brothers No. 2 Ditch 200 acres were irrigated. The Fred Collins Ditch was built in the eighties; 75 to 80 acres irrigated from it. Mr. Lundquist's ditch was the Konold ditch, built in 1881; 420 acres irrigated from it. Mr. Hogue had five or six ditches. Some were built in 1880.

892 The amount of irrigation under them in 1900 was more than two and one-half sections. Peter Cunningham Ditch called the Le Roy Ditch, was built in 1881 or 1882, and covers almost a section of land. Half a section was irrigated from the Cook Ditch. John Goetz had the Lone Tree ditch, built in 1885 and irrigated 360 to 400 acres. Davis Brothers No. 1 was built in 1885 or 1886.

893 It irrigated 360 acres at least. The tributaries of Sand Creek are very small and there was irrigation there. Shell Creek had land irrigated from it through Steamboat Lake, which overflowed in 1887. I irrigated 70 to 100 acres from Spring Creek



and Rice irrigated some and that took all the water of that creek. Andrew Johnson took all the water of Antelope Creek which emptied into Hutton and Creighton Lakes. The headgate of the Hogue & Haley ditch is on the Laramie River above Le Roy Bridge, about the middle of Township 14, North, Range 75. That was  
 894 built twelve or thirteen years ago by Mr. Hogue. About 1,800 acres were irrigated from it.

894 Cross-examination by Mr. Fred Farrar:

There were not less than 16,000 or 17,000 acres of land irrigated from Sand Creek and its tributaries. Sand Creek is naturally a tributary of the Laramie River and then is not. For quite a number of years, unless the water is very high it will not run into the Laramie River. It would run into Hutton's Lake, Lake Creighton and Lake Hutton, and fill those lakes up. It ran into Lake Hutton naturally. It always flowed in there until they got full, and then it would run into the Laramie river. If the creek flows heavily, after Lake Hutton is filled the water runs into the Laramie river. That was the condition when I first located on Sand Creek. It always has been the case so far as I know. The water which flows into Lake Hutton evaporates and seeps away. It has not been used for irrigation so far. Hutton and Sreighton lakes cover probably a section and a half. If you were to follow the channel of Sand Creek to Laramie river it would have no channel. If water overflowed the

Hutton lakes and passed on down to the Laramie river, it  
 896 would join the Laramie river on about Sec. 6, Tp. 14, R. 74.

Sand Creek rises over in Colorado. Its general course is northerly and a little westerly in some places. Shell and Antelope creeks rise in Colorado. These streams irrigate possibly 16,000 acres.

The statement that Hoge and Haley ditch irrigated 1,800 acres is a general estimate from the course it takes. I have been over the Gullihan ditch.

If the water of Sand Creek were not permitted to flow into these lakes it would naturally run down here and spread over the land; there is really no water course only about half a mile below the lakes.

LARAMIE, WYOMING, September 24, 1913.

JAMES HARDMAN.

Cross-examination (cont'd).

By Mr. Fred Farrar:

897 When I estimated that 18,000 acres of land were irrigated from Sand Creek and its tributaries, I made a mistake and I desire to correct that. I find in looking over my figures that were given before, a total of 6,276 acres were irrigated from Sand Creek and its tributaries. Then from that we will have to make a little deduction. Included in that is the Caldwell and Gardiner ditch,

898 which was afterwards thrown, and on the Boyd Rice place there is a claim for some amount of water for a reservoir and from that I deducted 300 acres. That left net 5,628 acres. Then besides that from Antelope creek, which had slipped my memory altogether, there is a record of 270 acres that is used in it when there is water. That is to be added. Making a total of 5,898 acres.

The land under the Caldwell and Gardiner ditch was deducted because they allowed it to go by default. The same land is now irrigated by the Cook ditch. The Cook ditch takes water from Sand creek and was filed on in 1901. The amount of land irrigated at this time would be 5,898 acres.

899 My deduction of 300 acres from the Boyd Rice place was made because he only has a right to fill up that reservoir when the water is not being used for irrigation. If he has water for his reservoir he irrigates 300 acres. That would be added to my total of 5,398. I deducted 348 acres under the Caldwell and Gardiner ditch, because in my sum total I added the 360 acres of the Cook ditch. There is a half section of land that is included in the Caldwell and Gardiner tracts, but there is only 260 acres irrigated.

Cross-examination by Mr. Delph E. Carpenter:

The Hutton Meadows were large and irrigated from Sand Creek and some from the Laramie river. They had two ditches  
900 from the Laramie river, the Dowling and Bilderback ditches, but those are further this way. There were a number of ditches from Sand Creek.

The lands irrigated on Sand Creek are meadows, native hay principally. There was always irrigated pasture amongst it. In the acreage given I have included that land irrigated to meadow and also for pasture. The Hoge and Haley ditch takes its water from the Big Laramie river. I stated that the Hoge and Haley ditch irrigated what I thought would be about 1,800 acres. I did not  
901 include in that 1,800 acres the land irrigated by the Caldwell and Gardiner ditch, but I did include that irrigated by the Bush and Holliday ditch. The Bush and Holliday ditch irrigates somewhat the same lands I gave as irrigated by the Hoge and Haley ditch. The 1,800 acre-estimated includes lands irrigated by both the Bush and Holliday and the Hoge and Haley ditches. It is principally native hay and pasture land, some of it has been plowed at times. Whenever plowed it has usually gone back to native hay, they let it go back, most of them, in two or three years.

The best results are obtained from raising native hay. Out of this 5,898 acres irrigated, 522 acres were irrigated from my ditches. That was mostly hay land, 95 per cent hay. Mr. Cunningham owned the Le Roy ditch. Both of these ranches and the water rights were later sold by me and Mr. Cunningham to Mr. Bruce G. Eaton. He is one of the owners of the Divide ditch, taking water from Sand Creek into the Cache la Poudre river.

## 902 Cross-examination by Mr. Fred Farrar:

I stated that I would look up the dates upon which these ditches were constructed. Some of the testimony yesterday was wrong. The ditches and the date of construction are: James Hardman, No. 2 ditch, 1878; Hardman No. 1, 1877; Le Roy, 1885; Caldwell and Gardiner, 1885; Gullihan, known as the Gullihan No. 2, 1880; Gullihan No. 1, 1880; Red ditch, 1880; Guilliham No. 21, 1882; Red ditch, 1882; Braden ditch, 1880; Nedart, 1880; Davis Brothers No. 1, 1881; Konold, 1885; that latter ditch is under the name of Lundquist and Konold. Lone Tree, 1890; Collins, 1887; Collins, 1890; Richards, 1886; Richards, 1888; Davis Brothers No. 2, and Alice Hardman, 1891; Lone Tree and A-telope, 1894; Bush, 1897; Davis Brothers, 1894; Lundquist, 1900; E. J. Boyd, 1889; E. J. Boyd, 1903; Jackson Brown, 1877; Payne, 1885; Diana Brown, 1876; Cook, 1901. These are ditches out of Sand Creek and its tributaries.

JOHN BIDDICK, a witness in behalf of Complainant.

Direct examination by Mr. N. E. Corthell:

903 I lived on a ranch in Albany County in Section 4, Township 17, Range 74, for more than twenty years. I built the Biddick ditch in 1897.

904 It has irrigated 578 acres ever since I took out my ditch. Raised hay and some oats. I know the Oasis Ditch. It passes through part of my land. The land under that ditch has been irrigated over twenty years to my knowledge.

905 The land between the ditch and the river has been irrigated as long as I have known the ditch.

## 905 Cross-examination by Mr. Fred Farrar:

I own Sec. 4, Tp. 17 N., R. 74 W. and I own a quarter section in Sec. 10, the same township and range. All of Sec. 4 west or south of the river is irrigated from the Biddick ditch. It irrigates about 235 acres in Sec. 10. I own the northwest quarter and irrigate probably 75 acres. It was not irrigated this year, there wasn't any water in the ditch this year. They took it all from us. The river wasn't high enough to irrigate any. There was irrigation under the ditch last year. The lands owned by others were also irrigated last year. In Sec. 11 there are 120 acres irrigated by this ditch. There was irrigation under the ditch in 1911. During 1910 I was irrigating my land. My land was irrigated in 1910, '11 and '12, but the others, I could not say much about. They had a little water in Sec. 4 and this quarter I had. I had water on that but the other I didn't turn any water on. The Oasis ranch is on Sec. 11, a part of which was irrigated from this ditch. No one is living on Sec. 10. In 1911 Dutton irrigated lands on Sec. 11 from the Biddick ditch. Those lands were not irrigated in 1912.

I have 10 or 12 acres in my field, I cut hay on. The other parties

under this ditch didn't cut any hay, they used it for pasture. No oats were raised under this ditch this year, or in 1912. In 1911 I had about 60 acres.

Most of the 578 acres under the Biddick ditch is not cultivated, it is irrigated for pasture. I cut hay on part of mine, had the 60 acres in oats and what was outside of that in pasture. I didn't raise anything in 1913.

I am in the stock business. My cattle range between the Big Laramie and the Little Laramie rivers. I have got quite a bunch of cattle. I have horses. I cut hay this year but not on this  
909 place. We cut a little hay in 1911, just 5 or 6 acres. My land is largely pasture and has been during the past few years, we have been short of water, that is the reason.

Cross-examination by Mr. Delph E. Carpenter:

I don't know who took my water this summer. In 1912 there wasn't any water then worth mentioning. In 1911 we had a  
910 little water. The headgate of my ditch is 4 or 5 miles above the junction of the Big and the Little Laramie rivers. No water comes into Big Laramie between my headgate and mouth of Little Laramie. My ditch is about 5 feet wide. It carries water from 2 to 3 feet deep. I have a rock dam.

I cannot take water through my ditch when the water is as low as it was in 1913. In 1912 it was pretty low. I have the principal use for this water in the Spring as early as possible. That is the time to irrigate meadows. For grain we don't need it until later. If I have water in June and the latter part of May I can get along and get a pretty fair hay crop. That is not early enough to irrigate for hay. No ditches take water between me and mouth of Little Laramie river.

911 It is surprising that I could not get water when the State Engineer's records of Wyoming show that in 1911 there was as high as 500 to 700 cubic feet passing my gate during June and in 1912 as high as 1,287 cubic feet. I have been devoting most of my time to looking after my cattle.

I don't know that I have found farming a failure. If I have got to be plain with it I don't think much of the country in this part as farming country. I have seen better stock countries than this, but it is pretty fair. I cannot tell you why this is not a farming country. I went there in 1893 and took the ditch out in 1897. I was handling cattle then. I have been in that business ever since. I got the first water in my ditch in 1898 and had plenty of it too.

I have been irrigating ever since, when I could get water.  
912 If I had a dam so I could take all the water that came down I could irrigate every year, but we can't take it all. We have to divide it up.

The Haley lands in Sections 10 and 11 irrigated from my ditch, I gave them half for allowing me to go through their land. I suppose I only own a half interest in the ditch. Since I have  
913 been down there I have seen one stack of hay on the Haley place at different times, a good sized stack. Outside of the little land that Haley cut over the rest has been used for pasture.

I lease land on the other side of the river for my cattle. I refer to the Talmadge-Buntin Company, lands they sold to eastern people. I have not been over each quarter section under the Oasis ditch. I have seen the water running over the land. I have seen the water turned out of the Oasis ditch and running over toward the river, the land was pretty near all under water wherever it could, a foot deep. There was a whole lot of flat land that runs right over towards the river. Over around the bend, north of the hill, on what  
914 we call the north valley in Tp. 18, there is a flat there covering a good many sections, I suppose, that flat was quite a good smooth piece of land in there to be irrigated. The ditch runs along the east edge. They raise lots of hay by this irrigation. Quite a lot of hay was cut along the ditch and along the river. Of course they haven't been irrigating it very strong the last year or two, but Haley put up a pile of hay when he had the land. I could not tell you whether he irrigated all the land, but it was supposed to be all under water. I rode through that bottom different times in several springs and it was just flooded. There was a pile  
915 of hay as far down as the railroad.

The Biddick ditch is about 3 miles long.

S. C. DOWNEY, a witness in behalf of Complainant.

Direct examination by Mr. N. E. Corthell:

I am a little past forty years of age and was born in Laramie, Albany County. Stephen W. Downey was my father. He was one of the organizers and was a director of Pioneer Canal until  
916 his death. The most of the time Secretary. Pioneer Canal was organized in 1878 and constructed in the fall of 1878 and the spring of 1879. Then it was enlarged in the fall of 1884 and spring of 1885. In 1909 or 1910 it was again enlarged from the headgate down to the Sodergreen Reservoir. The last enlargement was part of Lake Hattie system and afterwards the Laramie Water Company. The capacity of the canal has not been enlarged at any time except by the enlargement made in '84 and '85 and the enlargement spoken of in 1909.

917 The ditch as originally constructed in 1878 carried more than one-third the capacity of the present Pioneer Canal. The original capacity was 140 cubic feet to the second. Pioneer Canal has been used for irrigation of lands under it from 1879 to the present time. After my father's death I was Secretary of the Canal Company and one of the directors and a member of the Executive Committee until May, 1909. My father died in August, 1902. After the enlargement in '84 a survey was made at once by Mr. George A. d'Hemecourt. In the summer of '85 George G. Anderson, a civil engineer, went over the work and made a report on the High Line Canal and various reservoir sites. After that Mr. Loback in 1889 made surveys and maps; after that, in 1890, '91, '92 and '93 W. O. Owen, a civil engineer, and Charles Bellamy made a number of surveys.

918 The company was in financial difficulties and rather at a stand-still until 1906, '07 and '08, when Mr. H. N. Roach and R. D. Stewart made surveys and maps. The final surveys of Roach and Stewart were made in the fall of 1908. The stock was transferred in May, 1908, and the construction started on the present system. These surveys, examinations and reports covered in a general way, with small variations, just about what is known as the Lake Hattie or Laramie Water Company's irrigation system at the present time. One survey covered the present line of the North Canal of the Laramie Water Company, another came down through the canal as they have it constructed now, another one came out of the Sodergreen Reservoir and ran south practically taking the place of the South Canal, using another reservoir. The idea always was to use Lake Hattie for a reservoir as they have at the present time. One of these surveys followed the present Pioneer Canal High Line. The Wyoming Central Land & Improvement Company in 1884 purchased the stock of the Pioneer Canal Company.

919 The Wyoming Central owned the railroad land lying on the Laramie Plains between the river and other tracts and they undertook to construct the reservoirs and ditches as I have indicated. They sold the land to different purchasers from their incorporation until about 1891 or '92, when the hard times threw the land back onto their hands and the company was unable to keep up payments to the railroad, and in the fall of '94 the Union Pacific went into the hands of Receivers and suits were commenced against the Wyoming Central and the property was tied up in litigation until the spring of '99, when it was settled and adjusted, the Railroad Company taking back the title to most of the lands and afterwards selling them out to various people up till 1907.

920 The stock of the Pioneer Canal Company was sold to Mr. Mullin and Mr. Ryan. The same people were the owners of The Laramie Water Company system. The Pioneer Canal was then merged into the Lake Hattie system and all these interests have been united in the one company, the Laramie Water Company.

S. C. DOWNEY.

Cross-examination by Mr. Fred Farrar:

920 Born in Laramie, Wyoming. Forty years of age. Was 5 years of age when Pioneer canal company was organized in 1878. When I testified to the construction of the canal in 1878 or '79 I was not testifying from my own knowledge. When I testified concerning the enlargement made in '84 or '85 was testifying partly from my own knowledge. Was around the office and out on the work with my uncle. The evidence given up to the time

921 of my own personal knowledge is from old records and minute books of the Wyoming Central Land and Improvement Company and The Pioneer Canal Company, original contracts, original reports, original maps, and some of it from conversations with people who were there. Mr. Corthell has those things, I turned them over to him. I am a member of the bar. The testimony which



I gave relative to various examinations and surveys is based some on knowledge and some on the files of the company. I know personally that Mr. d'Hemecourt was doing that work out on the Pioneer canal. I also know of the surveys of Loback, that he was making those surveys and also the surveys of Owen and Ballamy. Of course the latter surveys of Roach and Stewart I personally know about because I had the work done.

The Roach and Stewart surveys were made in 1906, '7 and '8. Stewart was consulting engineer with Roach. I don't believe he did any actual field work. Stewart went over the work with Roach and Roach ran the levels and the lines and Stewart would assist in picking out the best lines.

922 The sale of stock of the Pioneer Canal Company that I mentioned as having been made to the same parties that constitute the Laramie Water Company, was not to the Laramie Water Company. The Laramie Water Company was not organized then. That sale was in May, 1909. While I say it was sold to the people who represented the Laramie Water Company, they were promoters of the Lake Hattie Company and the Laramie Water Company, and I suppose they are the owners. At any rate they were the people promoting the present scheme. Mr. H. N. Roach was formerly county surveyor.

Financial difficulties of the Wyoming Central Land and Improvement Company and trouble with the Union Pacific Railroad Company prevented them from completing their scheme. Part of the lands included in their project reverted to the Railroad Company. Most of the land lying under the Pioneer Canal, or a good part of it,

923 did not revert. Practically all of the land that lays above the Pioneer Canal, until you come to the land that is irrigated from the Little Laramie river, reverted to the Railroad Company. Those are part of the lands that are now included in the Laramie Water Company's system, with a good deal more land. These lands were later sold by the railroad to various persons. The most of it was sold before 1908 to different purchasers. It was sold to a great number of purchasers, from one section up to a township, that is, the railroad land in a township, 18 sections.

I have no personal knowledge of original capacity of Pioneer canal, except from the original contracts for the construction of the canal. I was secretary of the canal after the death of my father in 1902, until the transfer of the stock. The only connection I had with the company prior, was that I was in my father's office from 1895 and attended practically to work of the canal and also of the Wyoming Central Land and Improvement Company.

I know Mr. Sevison. I know he worked for the Arnold Engineering Company, but I thought it was after the original surveys were completed. I know Lyman Bishop. From the time that I was secretary of the company in 1909, I am not familiar with who did their work or what contracts were entered into. The Wyoming Central Land and Improvement Company contracted to purchase from the Union Pacific Railroad about 600,000 acres in Albany county and the east part of Carbon county inside the railroad limits. That is

within the grant made to the Union Pacific by the Government. The grant was for every other section for a distance of 20 miles on each side of the railroad. There were two other large purchases of railroad lands besides that of the Wyoming Central Land and Improvement Company. They were the Two-Bar or Swan Land and Cattle Company and what is known as the Gilchrist-Plunket, afterwards known as the Boughton or Iron Mountain ranch. The Wyoming Central contract included the railroad lands to the south of the city of Laramie and down to the Colorado line. It extended in an irregular shape north of Laramie on the east side of the river to the line between townships 20 and 21, then north and west to 20 and 22 and over into Carbon county. It was about 60 miles long north and south. When the Wyoming Central Company settled with the Union Pacific Railroad in 1899 these lands with small exceptions reverted to the railroad.

About half of the land reverted. The other half had been sold to settlers before the law suit with the Railroad Company. In a few instances the Railroad Company assumed the contracts or rather issued new contracts to the people that had applications into the company, but it was only to a very small extent. The lands that reverted were scattered east of Laramie in small holdings, some in the south part of Albany county, and a strip along the Big Laramie River from Laramie up. A part of those lands were under the canal as then constructed. A large block of land including down the Big Laramie and up the Little Laramie and from the Little Laramie over toward Rock Creek. Quite a number of contracts were still standing that had been partly paid. The company kept those. We paid the Railroad Company and got a deed for those lands in the settlement.

All the lands between the Pioneer canal and the Little Laramie Valley, except a strip along the Little Laramie and Big Laramie and under the Pioneer canal and also a few sections of land known as the Buford land, which lay practically west of Laramie, reverted. The Buford lands had been a military reservation. They joined on the west. After the enlargement of the Pioneer canal in 1884 and 1885 it was the same length, practically, as the old canal. The enlargement of 1884 and 1885 consisted of putting in a larger headgate and increasing the width and depth of the canal. I have not been able to find the map which I mentioned had been prepared by d'Hemecourt in 1884. It is on file in the United States Land Offices at Cheyenne and Washington.

The records of the company show it was a complete survey. It consisted of a line running over to the reservoir near Lake Hattie, what was then known as the High Line canal on the north side of the Laramie, Big Basir and laterals down through the Basin. I don't know which survey Mr. d'Hemecourt used. There were two surveys made, one coming out a mile or so above the present headgate of the Pioneer canal and running practically due northwest to Lake Hattie and dropping into Lake Hattie and extending on around on the rim of the basin were laterals coming out of Lake Hattie. There was another survey made that comes out of the Pioneer canal and Sodergreen reservoir and practically follows the same line, not so high, at

least not as high as Lake Hattie The survey was completed as to grades.

The ditch was not built on that survey. It was used more or less with other surveys made afterwards. The Pioneer Canal Company, through their agent, the Wyoming Central, made the other survey. The Wyoming Central Land and Improvement Company made this survey for the Pioneer canal. The companies were practically the same. The Wyoming Central acquired the Pioneer Canal in 1884. At that time 803 shares of the stock of the Pioneer Canal Company had been issued. Out of a total of 1,000 shares. The total capitalization of the company was \$10,000. The Wyoming Central paid par for this stock. The Pioneer canal paid a portion of its indebtedness by stock. I don't know whether or not the stock went in on that account at 50 per cent of its par value. After looking up my records I find that the survey which I mentioned as having been made by George G. Anderson must have been made in 1890, instead of 1885. That survey was independent from the survey made by d'Hemecourt, he used the d'Hemecourt survey though. I am not able to produce a plat of the survey made by Mr. Anderson, I don't believe one was ever made. I am unable to produce a plat of the survey made by Mr. Loback. The Anderson and Loback surveys were never filed for record to my knowledge. The Anderson and Loback surveys were also for the general system termed the High Line.

The ditch was not constructed under the Anderson survey or the Loback survey. The Owen survey was made in 1890 and the Bellamy survey somewhere between 1890 and 1893. Owen's survey was in December, 1891, and Mr. Bellamy's was in 1892 or '3. I was able to find a plat of the Owen survey.

(Plat marked defendants' exhibit 16.)

Defendants' exhibit 16 is the map of the Owen survey.

I now hand you a plat of the Bellamy survey.

(Plat marked defendants' exhibit 17.)

Defendants' exhibit 17 is the map of the Bellamy survey. It was made by Charles Bellamy.

Admitted by counsel for Wyoming, Mr. Corthell, that Mr. Bellamy is the same man who testified in this case.

The ditch was not constructed under the Owen survey. It was not constructed under the Bellamy survey. The Wyoming Central Land and Improvement Company authorized the Owen survey for the Pioneer canal. The same people authorized the Bellamy survey. This company had four distinct surveys made at different times in this proposed project. The last of these four was the Bellamy survey in 1893. The next surveys were made by H. N. Roach and R. D. Stewart in 1906, '7 and '8. In 1909 surveys were made. The

Roach and Stewart surveys were made for the Pioneer Canal Company. These surveys were for a line similar to the Bellamy survey, figuring a High Line canal using different reservoirs

and the south line. They were separate and distinct surveys. They were working in the field at different times during the three years on that work, not continually. These surveys were for what each surveyor termed a high line canal. Part of the canal has been constructed, the part from the river to Lake Hattie reservoir, and from Lake Hattie reservoir on east, they call the Stewart canal the North canal. It runs out of Lake Hattie and along the north part of the Big Hollow, down towards the northeast, toward the Laramie river. In a very general way I am familiar with the lines of this canal. Mr. Roach ran a line out of Lake Hattie down in that direction. I don't know who made any surveys after 1909.

933 The ditch was not built in 1909. Comparing the maps showing the Owen survey, marked Defendants' Exhibit 16, and the Bellamy survey, marked Exhibit 17, and eliminating the Pioneer canal then constructed, the headgate of the proposed High Line canal, was considerably further up the river than the headgate marked on the Bellamy map. The ditch was never constructed from head of this proposed canal as shown by Owen survey. The head of proposed canal, according to the Owen survey, is on the west bank of the Laramie river on the south line of Sec. 2, Tp. 13 N., R. 77 W. The head of the proposed canal under the Bellamy survey was on the west bank of the Laramie river near the quarter corner of Sec. 35, Tp. 14, N., R. 77 W. The line of the Owen survey runs through the east tier of sections in Tp. 14 R. 77. The Bellamy ditch runs through three south sections and then swings east around a hog back. On the map of the Owen survey Lake Hattie is located on the wrong section. The survey shows that both of them

934 would run to the west of Lake Hattie. Assuming that the Lake Hattie location is differently shown upon the two maps, there being approximately a mile difference in location, from Lake Hattie, on the Owen map the line runs through Sections 13, 14, 15, 16, 17 and 18, Tp. 15, R. 76, while in the Bellamy map it runs through about a mile north of that line, ending in Sec. 14, Tp. 15, R. 76, laterals run from Lake Hattie. The Bellamy map showing no laterals running east from Lake Hattie, while the Owen map shows two. The Owen line of the proposed canal continues on in a northeasterly direction until it lands down to within about four miles of Laramie, and there was a branch from that lateral on the township line between Tp. 15, R. 75 and 76, which ran north for 2 miles and northeast for a distance of from  $6\frac{3}{4}$  to 7 miles.

The two lines do not coincide at every point unless it be immediately west of Lake Hattie. On the Bellamy map the proposed line of this canal is in ink. There appears what is apparently the line shown by the Owen survey traced in *in* a lead-pencil. The lead-pencil marks practically coincide with the Owen map. The proposed line as shown by the Bellamy survey is shown by a dotted ink line marked "High Line ditch in course of construction." There are no designations on the leadpencil line at all.

935 The Murphy-Collins ditch was taken out of the Big Laramie River on the west bank, the location of the headgate being

about a mile above the headgate of the present Pioneer canal. That Murphy-Collins ditch is now owned by Oscar Sodergreen. I understand that part of the Murphy-Collins ditch is the same as the Sodergreen.

The line of the proposed High Line ditch as shown by the Owen survey, Exhibit 16, was at or near Wood's Landing.

The present canal leading to Lake Hattie Reservoir does not follow the line of the survey as shown by these two exhibits, that is, the Bellamy or the Owen survey. I should say that some of the lines run very close together. The topography of the country would naturally throw them somewhat in the same location.

936

LARAMIE, WYOMING, September 25, 1913.

S. C. DOWNEY, examination cont'd.

Cross-examination (cont'd) by Mr. Fred Farrar:

I do not have any map of the Roach or Stewart surveys. I have no record of these surveys, Mr. Roach has them. I think, however, they generally follow the line of the Bellamy and Owen surveys.

I found a report made by Mr. G. A. d'Hemecourt. That  
937 is the only report made on the d'Hemecourt survey that I know of. As to whether or not the d'Hemecourt survey was a preliminary one, the only thing I could find was a survey which was ordered completed sufficiently to hold the right of way over Government land. I understood it was a completed survey as the ditches were to be constructed after the cross-sectioning.

938 I can give the reason why the company did not build the High Line canal under the d'Hemecourt survey. The company was local and had invested all the money which could be raised locally. About 1888 times began to tighten and lots of people interested, particularly large holders consisting of Englishmen, were not able to pay out on their stock. Continually from the time of the organization of the company in 1885 the company tried to raise some money to build a system and was not able to finance the project either locally or through capital in England, France, Colorado or Kansas, and numerous other people. At different times there were probably some 10 or 12 different options, but no one was able to carry out any of these deals. When the Union Pacific Railroad company went into the hands of receivers it caused new complications, as they would not deed the land to the Wyoming Central on the old terms. Finally suit was started in the fall of 1894 by the railroad company to foreclose the vendors' lien. From then until the settlement of the suit in 1899 it was a practical impossibility to do anything. In 1899 a large part of the land reverted to the railroad company, which they sold out in small tracts and the company were not able to finance the proposition, until finally the Wyoming Central sold the stock of the Pioneer Canal Company to the present owners and the system was constructed. The hard times began to be felt here about 1888, but before that they were having these surveys made and trying to get in touch with capital. As I stated

before, the company was a local corporation and had invested all the money that could be raised here and could not assume any further liabilities than the purchase payments due on the land. Fifty per cent of the lands lying between the two rivers were Government, state and school lands. They were not in any wise affected by the contract between the Wyoming Central and the Union Pacific. I have produced what purports to be a report made by each of four surveyors, d'Hemecourt, Loback, Anderson and Owen. Each of these was an individual attempt to promote the scheme which

939 I have outlined. Each report is an engineer's prospectus, rather than a report on a definite survey basis. By that I would say it is a general report rather than a detailed report of the survey. By preliminary line I mean that they show a preliminary line in a general way, not reduced to detail and the general condition surrounding the whole situation. In each of these reports the High Line Canal is quite evidently located at different places and in

each instance is a mere open canal without any difficulties of  
940 construction. The High Line ditches, in any event, in order to irrigate lands situated at the higher levels than those irrigated by the Pioneer canal, would of necessity be limited in their location between the base of Sheep Mountain and Sodergreen Lake on the Pioneer canal, between the river and Sodergreen Lake. The western limitation of that land would be the base of Sheep Mountain. Right at the immediate toe of Sheep Mountain there is some broken land. Any competent engineer, in running any line for the irrigation by a higher line of ditch than the Pioneer canal, would be forced to place his line through the vicinity we have named, between Sodergreen Lake and the base of Sheep Mountain. The present inlet to Lake Hattie commences at Sodergreen Lake. The Murphy-Collins ditch was above the Pioneer. It has been abandoned for a number of years. The natural topography of the coun-  
941 try around Lake Hattie is rather steep and broken.

On the topographic sheet for the Albany County Laramie quadrangle of the United States Geological Survey, edition of July, 1908, and particularly as to Tp. 14, R. 74, Creighton Lake and Hutton Lake are differently located than on the Wyoming Central Land and Improvement Company map. On the Wyoming Central map Hutton Lake is given as the more northerly of the two, Creighton being the southerly. On the U. S. Geological Survey Quadrangle map Creighton Lake is given as the northerly lake and Hutton as the southerly. Hutton Lake is the more northerly one and is correctly set forth on the Wyoming Central map. Creighton lake is the southerly one. Those lakes, taken together, are generally known as Hutton Lakes.

Only \$8,030 of the original \$10,000 capital stock of the Pioneer Canal Company was paid for in full, 803 shares were issued. Some of the stock was paid for in cash and some in work and supplies. The stock was issued in payment of indebtedness. The original canal was not built out of that capital, there was \$964.09 owed on the canal at the time the stock was purchased by the Wyoming Central Land and Improvement Company, which was paid by the company.



The Pioneer Canal Company was not a mutual company in the sense that the users of the water were the stockholders. At the time the company was taken over by the Wyoming Central there were 25 stockholders. Very few of these stockholders were users of water. The 25 include the stockholders whose stock stood in one man's name as trustee. I think there were not users of water other than the

943 stockholders. When the transfer of the canal and properties was made to the Wyoming Central Company all of the capital stock of the canal Company passed to the Wyoming Central, except 7 shares, which were held by different individuals so they could be trustees in the Pioneer Company. In 1885, '86 and '87 water was donated to different users under the canal free of charge. From that on 50 cents an acre was charged per year for water until the year 1910. It was raised either in 1910 or '11 to one dollar an acre, the present charge. There were a few contracts called water deeds issued to some six water users of the canal so they could prove up on desert claims, which provided that they had a right to purchase water at not to exceed a dollar an acre, as fixed by the Board of County Commissioners. But the same became forfeited by non-user for two years. I find a record that Mr. Stewart was paid \$250 Jan. 6, 1906, and I think he was paid some in addition to that. Mr.

944 Roach was paid \$750 in one warrant April, 1906. The minutes of the meeting of the board of trustees of the Wyoming Central Land and Improvement Company of October 11, 1892, show this statement: "The matter of enlarging the Pioneer canal from the headgate to where the proposed high line extension is to be taken out was discussed, and it was the sense of the meeting that nothing be done in the matter at present." The minutes do not show any other minute of an action on this project subsequent to that date, except those which I have just mentioned, that is, the payment to Stewart and the order given to Roach, except in relation to the sale of the canal, and by that means finance another company to construct the same. From 1892 until 1899 the company was involved in litigation and was not able to do anything. Numerous attempts were made to sell the Pioneer canal. These were continued from about 1886 until the sale was made in May, 1909. The canal was not a financial success from the stockholders' standpoint. According to the financial statement for the year, beginning July 31, 1897, to July 31, 1898, the total amount received for the use of water from the canal was \$365.70, the reason for that was at that time we were having the suit with the Railroad Company and did not dare to enter into any contracts for water. The people wanted contracts for the water to prove upon Government land and they were afraid to execute any more. The people wanted water deeds or water certificates. Practically the only source of revenue from the canal was from the rent of water. The canal as an entity had no other source of revenue than the sale or rent of water. From about 1900 the water rent increased very materially. From 1897 the revenues of the canal from the rent of water were very small. The revenues were small during the years of 1898 and 1899, but as soon as the suit with the Railroad Company was settled the rents increased materially.

946 The receipts for the year 1908 were \$1,938.25. That was obtained from water rents, but did not include a large amount of water which was used by the Wyoming Central Land and Improvement Company, for which no credit was taken, amounting to about \$1,500 more.

Cross-examination by Mr. Delph E. Carpenter:

The Wyoming Central Land and Improvement Company reserved from sale, during the eighties the land within 2 to 5 miles of Laramie, on account of competitions over the Ft. Buford reservation. That was not the same as the Fort Sanders reservation. There were three reservations. It was first known as the Fort Buford reservation, then as Fort Sanders and then cut down again and known as Fort Sanders reservation. The later Fort Sanders reservation was a smaller area than originally included in the Fort Buford reservation. When the company first organized for the first two or three years this land was sold. The Government then refused to pass title, claiming the railroad had none and it was 4 or 5 years after that before the Government passed the title. The Government conveyed directly to the company on payment of \$2.50 an acre. After 1885 the  
947 company offered water from the Pioneer canal free for the first year to anyone that would use the water and then afterwards purchase it, and it was given free during the years 1885, '86 and '87 to all users. After that it was the practice of the company to allow free use of the water for the first year to encourage settlers. Any settler under the canal on land purchased from the railroad or Government had the benefit of this policy. It held up until some time about 1895 or '96.

S. C. DOWNEY, a witness in behalf of the Complainant.

Redirect examination by Mr. Clark:

947 After the sale of lands that could be sold to different purchasers the Wyoming Central tried to sell the lands in large blocks with the pioneer Canal, especially the lands lying between the two Laramies. Numerous options were given, one to John W. Hoyt, Ex-Governor of Wyoming, in 1885; in 1885 and '86 one to Robert Marsh, through English capital; one in July, 1889 to J. Douglas-Willan; one in January, 1890 to John Hess and John H. Poole; one in June, 1890, to John H. Poole and Samuel Lessen; two options to E. H. Salltiel and F. J. Stanton in 1895 and 1896; one to Carter-Adams in 1886; one to A. A. Johnson in 1892 and 1893; one to C. E. Wantland, and a man named Blitz and N. O. Bryant, in 1887.

948 The proposed High Line of the Pioneer Canal Company takes the place practically of the Stewart Canal. The South Canal takes the place of two canals running out of Lake Hattie, as shown on the W. O. Owen map, Defendant's Exhibit 16. I furnished all these records, reports and maps to counsel for defendants upon

their request and went over them with them at considerable length.

949 Work was started on the system and a lot of work done in 1909, when the stock was transferred to the new purchaser and the contract was let and the work continued.

949 Recross-examination by Mr. Fred Farrar:

An option was granted August 7, 1886 to J. M. Munford and George A. Starbird, of Longmont, Colorado, in which the land was offered between the Laramies for \$4.25 an acre with the canal, and \$3.50 without the canal. January 7, 1893, an option was given to A. A. Johnson for \$3.50 per acre to include the canal. That option covered all the land between the two rivers, subject to the reservation by the company selling any small tracts. I think there were no options given as low as \$2 an acre, except back early in 1885 or 1886, they might have given some for \$2. None of these options were exercised by the person or persons to whom they were given. In no event was the option fulfilled by a sale.

950 I stated that in my testimony I confused the north canal of Lake Hattie system with the line of the proposed Stewart canal. The Stewart canal was never built. If built it would take water from the Little Laramie as well as from Lake Hattie.

An option was given by The Wyoming Central Company June 23, 1890, at \$3.50 an acre, 1/5 cash and the balance in 4 equal payments, with interest at 6 per cent. That option was given on the lands between the Big and Little Laramie rivers, comprising about 65,000 acres, and included the canal.

Recross-examination by Mr. Delph E. Carpenter:

Ayres of New York published a number of ads for the sale of land in small tracts. The company has prospectuses published and mailed all over the country, but it did not accomplish anything.

THORNTON BIGGS, a witness in behalf of Complainant.

Direct examination by Mr. Corthell:

951 Have lived in Albany County about sixteen years. Live on the old Milbrook Ranch. Know the Oasis Ditch on the Laramie River which formerly belonged to Haley Live Stock Company. I was employed by that company 15 or 16 years. Left the ranch six years ago.

952 Had knowledge of the irrigation under the Oasis Ditch. All the irrigated land under that ditch was irrigated during the time I worked there. That includes all the land under the ditch, all the meadow part. I cut hay there every year off and on for six years. Every foot of the land lying between the ditch and the river down to the Ghost Ranch was irrigated for hay and pasture. The company run 5,000 or 6,000 head of cattle. That continued for 15 or 16 years that I worked there.

953 I was foreman of this cattle and the irrigation during that time. Rankin was head foreman on the ranch.

953 THORNTON BIGGS.

Cross-examination by Mr. Delph E. Carpenter:

They probably put up on the whole land there 1,500 or 1,600 tons of hay. We never measured any only what we baled. They fed most of it to stock.

We did not run cattle on this ranch during the summer. We ran the big part of them northwest of the ranch and they ran quite a number of them in about Muddy Springs. We sorted these cattle and fed hay to the weak during the winter. We weaned the calves towards the first of the year and fed them. The cows were sorted and the strong allowed to rustle, while we fed hay to the weak.

954 Fat cattle we ran separately. We kept them on pasture and maybe along toward spring we would give them all a little hay. Some years we did not cut quite as much hay as I have mentioned. A considerable part of this land under the Oasis ditch was not cut over. Take it in one of these valleys there might be 15 or 20 acres under that ditch we didn't cut, cut around. We just cut the heaviest hay. I could not tell how many thousand acres we cut to get this amount of hay, quite a number. Together with myself, we ran 4 or 5 men when irrigating.

955 Cross-examination by Mr. Fred Farrar:

When the men were not irrigating or putting up the hay they were fixing fences that were down and doing a little cropping. There were certain times in the spring when it took probably 7 or 8 men to handle these cattle, then we would get the cattle located and they dropped out and we cut down on these riders to do the irrigating and fencing and one thing and another. We cowboys had to be ranch hands as well as cow men. We took them all out of the saddle and put them in the hay fields for maybe two or three weeks.

Cross-examination by Mr. Delph E. Carpenter:

We commenced haying along in July and August, and finished up in September. We turned the water off of the meadow right after July 4. That was the usual custom.

THORNTON BIGGS.

Redirect examination by Mr. N. E. Corthell:

956 I think this Haley Live Stock Ranch has been cut up into small tracts and sold. It was a very large ranch, consisting of many thousands of acres.

WILLIAM J. COWAN, a witness in behalf of complainant.

Direct examination by Mr. N. E. Corthell:

956 I have lived on the Little Laramie since 1878; engaged in the ranching business.

957 I know the Haley Live Stock lands on the Laramie and the Oasis Ditch. I was employed on that property in 1900 or 1901, irrigating and looking after the stock. Was foreman of the ranch from the first of April until the following November. We tried to get water over nearly all the lands between the Oasis Ditch and the Laramie River. There would be a few high places that the water would run around. I suppose these places were sub-irrigated to some extent by the water running around. There wouldn't be a good deal of land in these high places.

958 Probably 40 to 50 acres out of a section. Mr. Bellamy laid out laterals and I helped build them, to distribute the water. We raised oats, barley, potatoes and native hay. It was a stock ranch.

958 WILLIAM J. COWAN.

Cross-examination by Mr. Delph E. Carpenter:

We had 50 or 60 acres of oats that year. They were located on the Little Laramie at the Home ranch, the old Wyoming ranch. After they put in the new road they abandoned that ranch.

959 The oats were irrigated from the Little Laramie. They were not under the Oasis ditch. The barley was right adjoining. That was irrigated from the Little Laramie too. I would say there were 6 or 8 acres. We cut the oats. I think they yielded about 800 bushels. I don't remember how much barley there was. The potatoes were raised adjoining the barley. They were irrigated from the Little Laramie. About 3 acres. I do not remember the yield, a very good crop. During the year that I was there there was nothing but native hay raised under the Oasis ditch. We had

960 a good crop, but we didn't measure the hay. Mr. Haley fed it to his own stock. We started at upper end of Oasis ranch and put up hay to the Diamond ranch. Below the Oasis was the Waters ranch, then the Red or McGibbons ranch and then the Ghost ranch. We cut hay here and there under the canal from the head to the lower end down near the Ghost ranch, and below the Ghost ranch. The Ghost Ranch cut 500 or 600 tons. The Ghost ranch was irrigated from the Oasis ditch, all on the east side of the river was certainly irrigated by that ditch. It belonged to Mr. Haley. I notice

961 that on the map attached to the answer of the defendants in this case showing the Oasis ditch and the Little and the Big Laramie rivers at their junction in Tp. 17 N., R. 74 W., that the Oasis ditch runs almost north until it gets pretty close to where Wyoming station appears on the map and then swings abruptly to the west and runs 5 or 6 miles. The Oasis ranch included that land under the ditch, from its head down not quite to the junction of the

Two Rivers, there is another small ranch that runs across the ditch,—the Biddick ranch. Mr. Biddick owns land on the north side of the river. Mr. Biddick's ranch was the west boundary of the Oasis ranch proper. The lands in Tp. 18, R. 74, on the north side of this hill, were very good, but it was not such a body of it together. It was not spotted, but it was a longer distance. The meadows at this time extend from the ditch almost to the river. The water from the canal, these laterals I spoke of about a moment ago, were taken out to distribute the water. There is more meadow on that tract of land now than in 1901. It increases from year to year. We had a camp on the Waters place. That belonged to Haley. Then we moved to the Ghost ranch and finished haying at that place, and we cut considerable hay all the way down. Some of the hay would go half a ton and some considerable more, better than a ton. It would go from a ton down to grass that wasn't worth cutting over the meadows. We considered real good that hay which would run from half a ton to a ton and a quarter or ton and a half was very good.

The cattle of which I spoke were run partly in the Black Hills region west of the Laramie River, partly toward James Lake and some would run in pastures on the west side of the river, in two large pastures and then what we called the north pasture, we had some cattle in there. On the east side of the ranch above the canal on the grazing land we had some cattle in the summer time. We used this hay in winter to take care of the milch cows, weaning calves and stock that we were obliged to feed. I was there with Mr. Haley several times, visited there. They baled quite an amount of this hay and shipped it. The water had been distributed there before the laterals were run, but they took out these laterals. This work was done to bring more land under irrigation and to distribute the water.

Cross-examination by Mr. Fred Farrar:

I worked there from April to along in November. The Ghost ranch is still kept up, also the Oasis ranch. All of the ranches have been kept up to the best of my knowledge, or were at that time. I would say the other ranches have been kept up as well as the Ghost ranch. They are farming the Ghost ranch.

WILLIAM J. COWAN.

Redirect examination by Mr. Corthell:

The Cooper Lake Ranch on the west side of the river was irrigated from the Big dam on the river and we cut hay there.

Recross-examination by Mr. Delph E. Carpenter:

We cut hay under the Cooper Lake ditch, 300 tons, perhaps more. I put up hay there with Mr. Haley's force, the land was under my jurisdiction the same as the land under the Oasis ditch. The hay I cut that year under the Cooper Lake ditch was all that was cut there by anybody. That was all native hay.



H. N. ROACH, a witness in behalf of the Complainant.

Direct examination by Mr. N. E. Corthell:

966 I know the location of the projected canal of the Laramie Water Company known as the Pioneer High Line. I helped make a survey for a ditch corresponding to that canal in 1897 and 1898. W. O. Owen was the engineer in charge of that survey.

967 In 1908 I next made a survey there. The lines of the ditch surveyed on these two occasions were very close to the same lines as the present location of the projected Pioneer High Line. My surveys were made for the Wyoming Central. I know the location of the North Canal of the Laramie Water Company. In 1906 I made a survey for a canal along that route.

968 We started August 9, 1906. I made that survey for the Wyoming Central. Started from the Pioneer canal and extended the survey 15 to 18 miles. The survey left the Pioneer Canal in Section 31, Township 15, Range 75.

968 H. N. ROACH.

Cross-examination by Mr. Fred Farrar:

I assisted Mr. Owen in running the line in 1897 or '98 for the proposed High Line. There is a map in existence. Mr. Owen made a plat of the proposed high line previously. We started along

969 for the first mile and a half, maybe two miles, and followed the old original survey. We diverted from it at certain places. My recollection is there were a few cuts and fills they were trying to cut out. There were stakes set on the original Owen line. It is not a preliminary survey. I left the Pioneer canal with my line in 1897 and '8. My recollection is they come out along above what we call the Sodergreen lake now. I think the second Owen survey was made to change the expense of the original survey.

970 We followed the original line very close outside of a few places where there was a heavy cut or a fill. I would say our second survey was really a more detailed survey of the original. I could not tell you whether the situation was improved.

I ran a line of my own in September, 1908. That was also for a high line. I have a plat of the survey. I have made contours every 5 feet on that line up there and made a map of it. I left the canal in Sec. 30, Tp. 14, R. 76. I made two or three surveys. One to start out at the river and run on the west side of the hill that lays between that and Sodergreen Lake, and then I started from the lake and ran around. That survey was made for the Wyoming Central Land and Improvement Company. I think at that time R. G. Stewart

971 was consulting engineer for the Wyoming Central Land and Improvement Company and I had orders, either from him or Mr. Corthell to go out there and start at one or two places and run a line.

I ran a line independent of any other survey. Mr. Stewart was consulting engineer and co-operated with me to a certain extent. He

made a survey out there. I did not run across any surveys  
 972 being made at that time by the Arnold Company or their  
 representatives. Neither by the Goldsborough Companies to  
 my knowledge. I consumed about six days in the field in making  
 this survey in 1908. Mr. Corthell and I had a dispute as to who got  
 the map or plat of this survey. I do not know what became of it. I  
 still have the field notes. My survey of what I call the Peggy Askins  
 ditch was taken out of the line of Pioneer canal somewhere close to  
 6 miles below the Sodergreen Lake. I do not have a map of  
 973 that survey or a sketch of it. I did not make one. I have  
 my field notes. That was also made for the Wyoming Central  
 Land and Improvement Company.

I am not able at this time to give, except in a general way, the line  
 of my survey. I know it followed practically the same line as the  
 present north canal. I have not been able to give a definite location  
 of my old High Line survey. I ran 3 or 4 miles out of the Pioneer  
 canal. I then passed in a general northeasterly direction around to  
 the west of the natural basin known as Lake Hattie. Then I swung  
 off to the east. No canal has been built following the line of that  
 survey.

974 If the Lake Hattie supply canal is correctly shown upon the  
 map attached to the defendant's answer, then my line was  
 different. We started at several places from the Pioneer  
 975 canal. I did not tie to anything there, everything was done  
 with angles. I tied to section corner in 36. The present  
 Lake Hattie Supply canal was built very close to one of my surveys.  
 It was not built from my survey.

I ran along the line of the old Collins-Murphy ditch in a preliminary  
 way. I found it impracticable, the cost was too great. Construction  
 work was done at one time upon the Murphy-Collins ditch. When I  
 got over with it I was sick and disgusted with it. There was never  
 any irrigation from the old Collins-Murphy ditch.

976 Cross-examination by Mr. Delph E. Carpenter:

The difference between the North Canal of the Laramie Water  
 Company and the Peggy Askins Ditch, that I surveyed, is that the  
 North canal comes out of the reservoir. The Peggy Askins ditch  
 came out of the Pioneer canal. The north canal was built and the  
 Peggy Askins was not.

R. D. STEWART, a witness in behalf of Complainant.

Direct examination by Mr. N. E. Corthell:

977 I am a civil engineer, residing at Laramie, Wyoming, since  
 April, 1902. I know the location of the Robertson-McConnell  
 Reservoir on the Colorado-Wyoming line on the Laramie River.

I made a survey in a way for a reservoir on that site and located a  
 site for a dam. There is a canon at the lower end of the reservoir  
 and the proposed dam was to be located at the upper end. Above  
 that the valley widens out from a half to three-fourths of a mile and

extending for 5 or 6 miles, crossing the Colorado-Wyoming line. I made my report December 15, 1905. The survey and observations were made three weeks to a month before that time. The survey was made for the Laramie Commercial Club.

978 In a general way I know the North Canal of the Laramie Water Company. At one time I made a survey for a ditch along approximately the same line as that occupied by the North Canal. Was consulting engineer of Mr. Roach of the Pioneer Canal Company. From the Sodergreen Lake to where their North Canal empties into Lake Hattie my survey was on virtually the same line as the Supply Canal. The survey leading out of Sodergreen Lake and over the present Supply Canal was made during the summer of 1906.

979 R. D. STEWART.

Cross-examination by Mr. Delph E. Carpenter:

The Robertson-McConnell Reservoir has never been constructed.

NELLIS E. CORTHELL, a witness in behalf of Complainant.

Direct examination:

979 I was chairman of the committee of the Laramie Commercial Club in 1905 which procured Mr. Stewart to make the survey of the reservoir site designated as the Robertson-McConnell reservoir, which was then known as the Boswell reservoir. When Mr. Stewart's report was received I kept it on file for a time, and as soon as I learned of the work the promoters of the Lake Hattie or Laramie Water Company project were doing included the Robertson-McConnell site I turned over to them this report and all the data the committee had for such use as they might be able to make of it.

980 Mr. NELLIS E. CORTHELL.

Cross-examination by Mr. Delph E. Carpenter:

I turned this over to these other people I think some time in the year 1908. I delivered it either to Mr. Talmadge or Mr. Buntin. It may have been to Colonel F. W. Bowen. I think the Commercial Club paid Mr. Stewart in the neighborhood of \$200 for this one piece of work. That was the only work he did for the Commercial Club.

(End of Transcript Vol. 2, Complainant.)

R. I. MEEKER.

Direct examination by Mr. N. E. Corthell:

982 I examined in the field the total area irrigated from the Little Laramie River from the head of the valley down to Two Rivers, including the irrigation from Seven Mile Creek and from Four Mile Creek. Four Mile is a tributary of the Laramie

River and Seven Mile is a tributary of James Lake. The outlet from James Lake is an artificial canal, and from that into the distributing system. In 1913 45,899 acres were irrigated from the Little Laramie River, 1,527 acres from Seven Mile Creek and 918 acres from Four Mile Creek, aggregating, the three sources, 48,344.

The drainage basin of Seven Mile Creek is within the General drainage area of the Laramie River shown on Exhibit A attached to the Bill of Complaint. The chief crop on these irrigated lands is native hay, a considerable acreage of oats, some alfalfa, a little barley, a little flax and some garden truck. There is a large acreage of irrigated pasture. The irrigation on the Little Laramie alone is 25,104 acres meadow, 18,550 acres pasture, 1,925 acres oats, 300 acres alfalfa, 20 acres flax.

The irrigation on Seven Mile is 1,237 acres meadow and 290 acres pasture; on Four Mile, 501 acres meadow, 417 acres pasture. All the irrigation of which I have spoken appears to be of long standing. I found evidence of additional lands irrigated in previous years, and not irrigated in 1913. The hay crop on these areas was very good, the oat crop good, and the pasture very good generally.

I know the location of the gauging station on the Little Laramie called Two-Rivers. It is below these lands at the lower end of them.

Cross-examination by Mr. Delph E. Carpenter:

I stated that Seven Mile Creek is not a natural tributary of the Laramie River. I have been informed that the water never ran over the embankment of the natural depression of James Lake. The water that used to go into Lake James evaporated and probably some of it seeped away. Most of it evidently evaporated. All it required to make use of the water that had previously wasted away was the cutting of an aperture through the natural embankment. The cut was approximately 17 or 18 feet in depth below the deepest point in the natural rim, and it gradually tapered out. It was about 1,300 or 1,400 feet in length. The construction of this cut the waters from Seven Mile Creek, which had previously been allowed to evaporate and go to waste, were utilized for the reclamation of lands. If the reservoir outlet apparatus or gates were left open the making of this cut would so connect Seven Mile creek with Four Mile creek as to make Seven Mile creek a tributary of Four Mile creek and therefore of the Laramie river. So far as any irrigation in the Laramie Valley is concerned, the waters that come from this lake are added to the waters already obtained from other sources.

I would say that roughly 6 feet in depth over the entire exposed area would annually evaporate, from year to year, from James Lake as it stood in its natural condition. The James Lake I refer to is the same body of water noted on the map attached to defendants' answer as Lake James and appearing in townships 17 and 18, R. 76 W. It is the same body of water now utilized as a storage

reservoir by what is called the Talmadge-Buntin project. The 1,237 acres of irrigated meadow and 290 acres irrigated pasture which I gave as irrigated from Seven Mile creek are all located above James Lake. I did not include any waters which are discharged from Seven Mile creek into James Lake. On Four Mile Creek the irrigated area extended both above and below the lake. Four

987 Mile creek is naturally a tributary of the river. My knowledge of this irrigated area on these streams is confined to my observation made during these days in October of this year and some small knowledge from previous observations during 1912 and '13. I knew nothing of the valley prior to that time. The land from which native hay had been cut was classified as irrigated meadows, and those irrigated lands with native hay which had not been cut were classified as irrigated pasture. I made no measurements to ascertain the tonnage of hay cut on the 501 acres on Four Mile creek. I made no observations as to the tonnage of hay cut on any of this meadow land, I asked several of the ranchmen with reference to the production. I made no measurement of the hay in stacks.

988 My gauging station on the Little Laramie River is located one mile below Fillmore post office. I have a station near Fillmore. Lower station is first one above station at Two Rivers. Can give total acreages, by sections and townships, irrigated above Fillmore and below Fillmore on Little Laramie. In ascertaining these acreages I took topographic sheets of Laramie and Medicine Bow Quadrangles into field and platted in colors various areas under irrigation, using cultural features such as fences, location of houses, topography, canals, and so forth, to block out areas, driving over portions of each section. Used speedometer on automobile at times, to ascertain mileage and fractions of miles. Consider that, while there was no great refinement used in making estimates, total area of lands irrigated from Little Laramie river should come within 2 per cent and in special instances of smaller acreages with 5 per cent of correct area. These areas could have been determined by detailed survey but not in time for this testimony. Even in these meadows there are areas sometimes including several acres, not cut at all. Are also spots and small tracts of waste and uncultivated lands. These areas eliminated from areas in each section by percentage basis; correction made for areas around ranch buildings, river bed, embracing sloughs and draws and areas for roads, etc., were applied to each section based on the observation. Simply went upon ground and looked around, going over the meadows and observing with eye, making what seemed proper deductions of various tracts not cultivated, or waste. Had time been taken to survey tracts with instruments, observations would have been more accurate. Irrigated meadows were lands on which native hay is raised and cut at time of observation and areas of high ground or grease wood, sloughs or draws or river bottom were excluded, after observations made

990 in manner stated. Irrigated pasture consists of meadow lands from which no hay was cut this year, also higher bench lands under ditch, irrigated in 1913. Includes all lands under

ditches not cut for hay upon which was a forced growth of grass, better than natural. Some areas along Little Laramie river some years cut hay, other years not cut, are meadow lands, but used for pasture that year. Considerable portion of total 18,550 acres irrigated pasture on Little Laramie of that class. In some places rough to cut, in others sufficient hay produced in meadows portions were left to be pastured during fall and winter. Considerable amount is where hay production is heavy. Difficult to estimate acreage of this class, had other matters to work out, made no note of it,

991 could not give figures. Some land under these canals is absolutely waste land in so far as irrigation is concerned. Considerable areas in places tilled and irrigated in former years were not included in totals given because not irrigated in 1913, would be an addition to figure given.

Acrease I gave includes all land under James Lake system. In 1913 there were 515 acres irrigated under Talmadge-Buntin project. Approximately 1,000 acres under that project tilled previously but not irrigated in 1913. This I consider as irrigation

992 of several years' standing. Irrigated probably within 4 years, since 1909. From evidence I observed, there have been about 1,500 acres irrigated under Talmadge-Buntin project. Includes about 1,000 acres given as abandoned for 1913. On various tracts previously irrigated and tilled under Talmadge-Buntin project, irrigated in 1913, houses and buildings unoccupied. Approximately 12 families occupying land and tilling under Talmadge-Buntin project in 1913. Do not know number families there in 1909, '10 and '11. Judging from buildings and improvements there had been many more than number given. If lands under the Talmadge-Buntin project, or what is commonly called James Lake project, not considered, we deduct 515 acres from total irrigated acreage given. 445 acres oats and 70 acres alfalfa. 12 or 13 different fields varying from 5 to 70 acres, included in oats acreage. Alfalfa ran

994 in four fields, acreages from 3 to 20. Two 20 acre fields. Fields ran chiefly 10 and 20 acres. Did not ascertain tonnage production in 1913. In two or three instances, alfalfa under the Talmadge-Buntin project was poor, others no better than fair. Do not know number of cuttings harvested on fair stands. Some alfalfa not cut because too poor. Probably average crop oats on 445 acres, two or three instances of very poor ones. Do not know production in bushels.

May be some lands included in irrigated total given, on the Blackburn ranch, as recent in irrigation as Talmadge-Buntin irrigation. Blackburn ranch located on bench lands between Little Laramie river and Seven Mile creek in Tp. 17 N., R. 76 W. and Tp. 17 N., R. 75 W. Irrigated portion lies about south James Lake.

995 Cannot give acreage in that ranch of recent reclamation. Other than these two acreages no others appear to be of recent reclamation.

Two Rivers gauging station above mouth of Four Mile creek, but below all lands in drainage area of Little Laramie proper.

(Complainant's Exhibit E offered in evidence.)



## (COPY OF COMPLAINANT'S EXHIBIT E.)

## 1913 Irrigated Lands of Little Laramie River.

Field Examination and Mapping by R. I. Meeker, Accompanied by E. D. Titus, on October 2, 3, 4, 7, 8, 9, 10, and 30, 1913.

Section.	Township & range.	Meadow.	Pasture.	Oats.	Alfalfa.	Total.
1	14 N., 78 W.....	242	236	...	...	478
2	.....	103	19	...	...	122
11	.....	98	...	...	...	98
12	.....	119	15	...	...	134
		<hr/> 562	<hr/> 270	<hr/> ...	<hr/> ...	<hr/> 832
6	14 N., 77 W.....	50	46	...	...	96
7	.....	...	82	...	...	82
		<hr/> 50	<hr/> 128	<hr/> ...	<hr/> ...	<hr/> 178
1	15 N., 78 W.....	59	292	...	...	351
3	.....	...	36	...	...	36
10	.....	175	43	...	...	218
11	.....	218	125	...	...	343
12	.....	...	230	...	...	230
13	.....	33	600	...	...	633
14	.....	400	228	...	...	628
15	.....	110	...	...	...	110
22	.....	15	100	...	...	115
23	.....	400	120	...	...	520
24	.....	370	120	...	...	490
25	.....	527	100	...	...	627
26	.....	474	82	...	...	556
27	.....	80	330	...	...	410
34	.....	140	90	...	...	230
35	.....	540	84	...	...	624
36	.....	590	...	...	...	590
		<hr/> 4,131	<hr/> 2,580	<hr/> ...	<hr/> ...	<hr/> 6,711
1	15 N., 77 W.....	122	...	...	...	122
2	.....	145	70	...	...	215
3	.....	...	175	...	...	175
4	.....	70	120	...	...	190
5	.....	182	82	...	...	214
6	.....	367	320	...	...	687
7	.....	150	120	...	...	270
8	.....	57	32	...	...	89
9	.....	30	25	...	...	55
10	.....	...	165	...	...	165
11	.....	125	...	...	...	125
12	.....	50	...	...	...	50
18	.....	51	230	...	...	281
19	.....	107	12	...	...	119
30	.....	300	...	...	...	300
31	.....	97	4	...	...	101
		<hr/> 1,853	<hr/> 1,305	<hr/> ...	<hr/> ...	<hr/> 3,158
26	16 N., 78 W.....	...	150	...	...	150
27	.....	...	59	...	...	59
34	.....	58	10	...	...	68

Sec- tion.	Township & range.	Meadow.	Pasture.	Oats.	Alfalfa.	Total.
35	.....	77	287	...	...	364
36	.....	10	325	...	...	335
		<u>143</u>	<u>831</u>	...	...	<u>974</u>
1	16 N., 77 W.....	...	250	...	...	250
2	.....	180	...	...	...	180
3	.....	85	...	...	...	85
4	.....	30	...	...	...	30
10	.....	50	...	...	...	50
11	.....	155	25	...	...	180
12	.....	...	530	...	...	530
13	.....	170	120	...	...	290
14	.....	...	27	...	...	27
25	.....	46	...	...	...	46
36	.....	369	12	...	...	381
		<u>1,085</u>	<u>964</u>	...	...	<u>2,049</u>
1	16 N., 76 W.....	425	150	...	...	575
2	.....	450	58	...	...	508
3	.....	376	145	...	...	521
4	.....	429	30	...	...	459
5	.....	74	43	B15	...	132
6	.....	...	304	...	...	304
7	.....	277	223	...	...	500
8	.....	542	64	...	...	606
9	.....	620	...	...	...	620
10	.....	520	100	...	...	620
11	.....	470	115	...	...	585
12	.....	423	147	...	...	570
13	.....	...	100	...	...	100
14	.....	55	200	...	...	255
15	.....	475	135	...	...	610
16	.....	480	135	...	...	615
17	.....	585	4	...	...	589
18	.....	140	...	...	...	140
19	.....	100	115	...	...	215
20	.....	400	125	...	...	525
21	.....	...	500	...	...	500
22	.....	...	420	...	...	420
23	.....	10	465	...	...	475
24	.....	...	190	...	...	190
26	.....	...	46	...	...	46
28	.....	...	173	...	...	173
29	.....	102	240	...	...	342
30	.....	346	22	...	...	368
31	.....	115	69	...	...	184
		<u>7,414</u>	<u>4,318</u>	<u>15</u>	...	<u>11,747</u>
1	16 N., 75 W.....	390	...	...	...	390
2	.....	60	15	...	...	75
3	.....	...	20	...	...	20
4	.....	180	75	...	...	255
5	.....	540	120	...	...	660
6	.....	626	75	...	...	701
7	.....	440	65	...	...	505
8	.....	275	...	...	...	275
12	.....	150	...	...	...	150
16	.....	...	150	15	...	165

Sec- tion.	Township & range.	Meadow.	Pasture.	Oats.	Alfalfa.	Total.
17	.....	...	215	...	...	215
18	.....	85	150	...	...	185
19	.....	390	54	...	...	444
20	.....	80	300	...	...	440
21	.....	...	84	87	...	171
		3,166	1,383	102	...	4,651
10	Poverty Flat .....	...	474	...	...	...
14	Ditch .....	...	155	...	...	...
15	Not irrigated 1912-13.....	...	190	...	...	820
S. M. 12	17 N., 77 W.....	75	160	...	...	235
S. M. 13	.....	...	50	...	...	50
		75	210	...	...	285
S. M. 7	17 N., 76 W.....	33	...	...	...	33
S. M. 9	.....	230	...	...	...	230
S. M. 10	.....	165	30	...	...	195
S. M. 16	.....	307	10	...	...	317
S. M. 17	.....	350	...	...	...	350
S. M. 18	.....	77	40	...	...	117
		1,162	80	...	...	1,242
23	.....	...	175	...	...	175
24	.....	...	240	10	4	254
21	.....	...	180	...	...	180
22	.....	...	190	...	...	190
25	.....	...	20	360	120	500
26	.....	...	80	480	...	560
27	.....Flax 20	45	333	...	18	416
32	.....	...	140	...	...	140
33	.....	...	320	...	...	320
34	.....	...	270	115	...	385
35	.....	...	185	120	...	305
36	.....	63	20	...	...	83
		20	1,270	2,233	142	4,750
Deduct: Seven Mile..		1,162	80	...	...	1,242
		20	108	2,153	142	3,508
13	17 N., 75 W.....	96	10	...	...	106
19	.....	...	155	...	...	155
20	.....	...	270	...	...	270
21	.....	100	...	...	...	100
22	.....	318	140	...	...	458
23	.....	370	200	...	...	570
24	75 tilled, no crop.....	218	75	W90	50	433
25	75 " " " .....	138	140	...	...	278
26	.....	560	60	2	...	622
27	.....	520	100	...	...	620
28	.....	615	...	...	...	615
29	.....	280	50	59	28	415
30	65 tilled, no crop.....	340	90	100	12	542
31	.....	270	...	...	...	270
32	.....	530	77	...	...	607

## THE STATE OF WYOMING VS.

Sec- tion.	Township & range.	Meadow.	Pasture.	Oats.	Alfalfa.	Total.
33	.....	400	215	...	...	615
34	.....	420	200	...	...	620
35	.....	300	125	...	...	425
36	.....	...	60	...	...	60
	215	5,475	1,967	251	88	7,781
8	17 N., 74 W.....	172	243	27	...	442
9	.....	...	165	...	...	165
15	.....	...	75	...	...	75
16	.....	...	247	...	...	247
17	.....	97	427	...	...	524
18	.....	300	78	...	...	378
19	.....	...	460	...	...	460
20	130 tilled ground.....	293	157	...	...	450
21	.....	...	(e) 50	...	...	50
29	30 " " .....	25	100	...	...	125
30	14 " " .....	230	180	...	...	410
	174 " " .....	1,117	2,182	27	...	3,326

W—Wheat.

(e)—Estimated.

7	16 N., 74 W.....	...	100	...	...	100
8	.....	...	69	...	...	69
16	.....	...	20	...	...	20
17	.....	...	50	...	...	50
18	.....	...	230	...	...	230
	.....	...	469	...	...	469

## Four Mile Creek:

27	18 N., 76 W.....	...	10	...	...	10
28	.....	20	17	...	...	37
29	.....	37	...	...	...	37
31	.....	17	185	...	...	202
33	.....	52	...	...	...	52
36	.....	270	30	...	...	300
	.....	396	242	...	...	638

36	18 N., 77 W.....	50	175	...	...	225
	.....	50	175	...	...	225

1	17 N., 76 W.....	55	...	...	...	55
	.....	55	...	...	...	55

## Seven Mile Creek:

17 N., 77 W.....	75	210	...	...	285
17 N., 76 W.....	1,162	80	...	...	1,242
	1,237	290	...	...	1,527

## Under James Lake System.

Sec- tion.	Township & range.	Meadow.	Pasture.	Oats.	Alfalfa.	Total.
28	19 N., 74 W.....	...	...	40	...	40
32	.....	...	...	60	20	80
	.....	...	...	100	20	120

Section.	Township & range.	Meadow.	Pasture.	Oats.	Alfalfa.	Total.
4	18 N., 74 W.....	...	...	35	10	45
7	.....	...	...	5	5	10
8	.....	...	...	110	...	110
17	.....	...	...	20	...	20
19	.....	...	...	40	...	40
30	.....	...	...	...	20	20
		—	—	—	—	—
		...	...	210	35	245
36	19 N., 75 W.....	...	...	65	15	80
13	18 N., 75 W.....	...	...	70	...	70
		—	—	—	—	—

## RECAPITULATION.

*James Lake System.*

	Oats.	Alfalfa.	Total.
T. 19 N., R. 74 W.....	100	20	120
T. 18 N., R. 74 W.....	210	35	245
T. 19 N., R. 75 W.....	65	15	80
T. 18 N., R. 75 W.....	70	...	70
	—	—	—
	445	70	515

NOTE.—1,000 acres (estimated) as tilled in prior years. No crop in 1913.

## RECAPITULATION.

*1913 Irrigation Lands of Little Laramie River.*

Township & range.	Meadow.	Pasture.	Oats.	Alfalfa.	Total.
14 N., 78 W.....	562	270	...	...	832
14 N., 77 W.....	50	128	...	...	178
15 N., 78 W.....	4,131	2,580	...	...	6,711
15 N., 77 W.....	1,853	1,305	...	...	3,158
16 N., 78 W.....	143	831	...	...	974
16 N., 77 W.....	1,085	964	...	...	2,049
16 N., 76 W.....	7,414	4,318	15	...	11,747
16 N., 75 W.....	3,166	1,383	102	...	4,651
17 N., 76 W.....	108	2,153	1,085	142	3,508
17 N., 74 W.....	1,117	2,182	27	...	3,326
17 N., 75 W.....	5,475	1,967	251	88	7,781
16 N., 74 W.....	...	469	...	...	469
19 N., 74 W.....	...	...	100	20	120
18 N., 74 W.....	...	...	210	35	245
19 N., 75 W.....	...	...	65	15	80
18 N., 75 W.....	...	...	70	...	70
	—	—	—	—	—
Flax 20	25,104	18,550	1,925	300	45,899
16 N., 75 W.					
Poverty Flat Ditch (a).....	...	820	...	...	...
17 N., 75 W. tilled (a).....	...	...	215	...	...
17 N., 74 W. " ".....	...	...	174	...	1,209
					—
					47,108
Seven Mile Creek.....	1,237	290	...	...	1,527
Four-Mile Creek.....	501	417	...	...	918

(a)—Not irrigated in 1913. Irrigated in prior years.

Nov. 7, 1913.

18—7

R. I. MEEKER.

## Cross-examination.

By Mr. Charles F. Tew:

In whole valley found about 300 acres alfalfa. That included Little Laramie valley and ditches from that stream. There was a large body of land brought under irrigation, under James Lake system, in 1909, that had not been previously in any irrigation system, 70 acres of this in alfalfa. Land under this system  
 996 is more bench land than remainder of Little Laramie Valley.

On land where 70 acres alfalfa is located large area has been capable of irrigation from James Lake system since 1909. Could have been irrigated in 1910, '11, '12, '13. Works were completed in 1910 and subsequent years. Remainder of valley where alfalfa was found is in stock raising country. Twelve families mentioned under James Lake project have been engaged more in rais-  
 997 ing crops requiring breaking of land than in raising native hay. Since 1908, at least, think that project has been farming less land each successive year. For irrigation purposes venture under the James Lake project, on area mentioned, is different from irrigation of pasturage and hay lands along other streams described, including Little Laramie.

Remainder of locality, where I found 18,550 acres irrigated pasture, 25,104 acres native hay, and along Seven Mile creek 1,237 acres meadow and 290 acres irrigated pasture, and Four Mile creek, 510 acres of meadow and 417 acres pasture, was ranch or stock country. From improvements and conditions would say business of stock growing had been well established on this area except under James Lake, showing that drift had been to establishment and permanency of stock growing. Also showing that where the experiment had been made of irrigating under James Lake project in 1909 possibly, and to my knowledge in 1910, '11, '12 and '13, the area had shrunk from year to year, and there were abandonments of homes and effort and the experiment had been failure, temporarily at least. Works under James Lake project completed in 1909. There had been sufficient works and water to irrigate lands under James Lake project, but believe there was shortage of water in earlier years.

998 Outlet ditch and works had been constructed to serve larger area than twelve farms. There was water and ditch capacity enough to irrigate several times number of acres irrigated in 1913. Did not include any lands under this project as irrigated except twelve farms.

In remainder of 48,000 acres scattered along Little Laramie valley, found 230 acres alfalfa, located mostly down stream in small  
 999 acreage; good portion on Blackburn ranch which runs more to upland than valley.

In valley of Little Laramie found 1,925 acres oats, subtracting 445 acres under James Lake project, would leave 1,480 acres Little Laramie exclusive James Lake project. Oat fields mostly on Blackburn ranch, eighties and sixties. Aside from Blackburn ranch, there is small area of oats or alfalfa at many ranches, with large



areas of native hay and irrigated pasture. Owners are engaged in stock raising, supplemented by the necessary farming. Alfalfa raised for home consumption. Oats for cow ponies, alfalfa for winter feed. Exclusive of James Lake project, Blackburn ranch is more farming proposition than others; oats there better than average of valley. Was informed that best oats on Blackburn ranch went 55 bushels to acre. Conditions on that ranch same as throughout valley, except it is upland or bench land, no more favorable than others. Blackburn lands smooth and slopes to east. Water beneath soil not near surface, ranch more exposed to wind than others. Feund winds as strong there as elsewhere.

#### Cross-examination.

By Mr. Delph E. Carpenter:

Cannot give population of area comprising 48,344 acres. There are more than twenty families. Many of ranches in valley have supplementary lands on surrounding hills. Some range land open to general public. In upper reaches of stream, near Centennial, mountains are immediately adjacent to irrigated lands and are used for grazing. Practically entire area used for winter feeding of stock ranged in mountains or open range in Laramie Plains region.

General average of oats on Blackburn ranch about 40 bushels per acre but did not consult threshers. Two Rivers gauging station on Little Laramie located 400 feet above road bridge and approximately  $\frac{1}{3}$  mile above confluence with Big Laramie river and below all ditches on Little Laramie river. Station near Fillmore located in Sec. 2, Tp. 15 N., R. 77 W., about one mile below Fillmore post office, below headworks of Bellamy canal, and, with exception of two or three minor ditches, above irrigated area of the Little Laramie river below cañon immediately north of Sheep Mountain. Cañon approximately two miles above head of Bellamy ditch. Measurements taken at Fillmore station would not account for diversions by Bellamy canal, or its enlargement, but in conjunction with Fillmore station, records were secured on Bellamy canal at Wright's bridge. In event no such records were obtained, Bellamy diversions would not be included in records of flow at Fillmore station.

All lands in Tp. 14, ranges 77 and 78 W., Tp. 15, R. 78 W., and all of Tp. 15, R. 77 W., except sections 1 and 2, are irrigated by ditches diverting water above Fillmore station, as shown on plaintiff's exhibit E. a table prepared by me and showing irrigated lands in Little Laramie Valley, the Seven Mile and Four Mile valleys. Any measurement of flow at Fillmore station is water left in stream after irrigating lands in townships mentioned. Rating station maintained by U. S. Geological survey near Fillmore was located at May's ranch, a mile and a half above Fillmore Post Office and above Bellamy canal. Below all other canals in townships mentioned except one or two ditches between these stations. Their di-

versions are insignificant and would not vitiate conclusion as to totals.

On the table of irrigated areas, exhibit E, did not classify as irrigated pasturage all land under various ditches not used for meadows. I mean that in all portions of eight days' labor I ascertained with sufficient certainty for problem in hand acreage of irrigated meadow and pasturage of drainage areas specified on table.

Of lands under canal did not include in classification portions which have not been irrigated and also tilled lands upon which there were no crops this year. Exclusions were made in number of instances because not irrigated in 1913. In irrigated pastures determined irrigated land from production of native pasturage and native hay on the ground uncut and by ditches and other features. Followed areas under ditches. Land protected by fence and thereby had considerable increase growth excluded from irrigated pasturage. Used no instrument in making observations or deductions.

Referring to page 2 of table, exhibit E, and to Sec. 2, Tp. 15 N., R. 77 W., ascertained 145 acres meadow and 70 acres pasture, total 215 acres by methods described. Valley is narrow there, Sheep mountain slopes ascend quite abruptly. Do not think am in error

100 acres on that land. Two or three ditches take out above that section carried over into a Branch tributary into Lake

1006 Hattie and irrigates below Porter Lake. Referring to Sec. 1, same township and range, show 122 acres of irrigated meadow cut this summer. Think this correct. A correct stadia measurement would tell. In Sec. 1, Tp. 16, R. 77 W., there are 250 acres irrigated pasturage. The Loback canal runs across that section, probably some seepage from it, water also turned out, through headgates. Water turned from Bellamy canal on that land

1007 below. Also includes ditch out of Mill creek above. Table includes irrigated lands on Mill creek, tributary of Little Laramie, and some land irrigated above Bellamy ditch. The 530 acres irrigated pasture on Sec. 12, same township, irrigated from Mill creek chiefly. Traversed land in auto and got out and walked in places. Had no assistance; Mr. Titus went along as a witness because of his knowledge of country. Did not guess at it. Determined lengths and widths of land by blocking off according to subdivision fence lines, ditches and contours and other cultural features. Used as much care up in that section as further down.

1008 Remember it very clearly. Think work on that section represents conditions there. Where no fences measured off distances by automobile and located sections lines and corners. Speedometer on auto measures within 1/10 of mile. That was what I used. Am not in error about 150 acres on the irrigated land in Sec. 2,

Tp. 16, N., R. 76 W. Made no note of acreage of potatoes and garden truck. Very small area around the ranch buildings and paid no attention to them. Almost invariably these were intended for local consumption. Do not believe that table shows 275 acres more land irrigated to pasture in Section 6 in that township than exists. As I recall, water is turned out of Loback

- canal at headgate just above bridge at head of draw there and natural drainage utilized in distribution. Believe there is lateral under Bellamy canal, a short distance below. When I refer to the Bellamy I mean enlargement of Bellamy or Loback ditch. Recall that section fairly well. Was over it more than once because my areas overlapped. Worked up Mill creek after general
- 1010 body of land below Mill creek and my areas overlapped there. Grass on that section not best in world for irrigated pasture, because it has been well pastured. Cattle have access to it. Not like many pastures where cattle had been kept out during growing season. Cattle in there when made observations. Found 500 acres pasture on Sec. 21, Tp. 16 N., R. 76 W. irrigated from Ernest or Hecht ditch, water being turned out in draws in section above and run down across to that land. Show 390 acres irrigated meadow Sec. 1, Tp. 16, R. 75, cut over in 1913. A stadia measurement, if properly made, by competent man, would reveal true conditions there. Granted such would be more accurate than my work. In
- 1011 determining areas the judgment as to what has been irrigated would enter. In meadow classification anyone can see where mowing machine has gone. In Sec. 4 of the same township, 180 acres of irrigated meadow and 75 acres of irrigated pasture shown. Do not believe this is about 100 acres in excess of the meadow and 75 acres in excess of irrigated pasture. The 160 acres irrigated pasture for Sec. 16 is not 100 acres excessive. On Sec. 19 in the same township 390 acres of irrigated meadow and 54 acres of irrigated pasture shown. Could easily see meadow. Figures not made by instrument measurement. Do not consider method haphazard way. Have platted areas in this way on Boulder creek for similar problems. In irrigated meadows some pretty irregular places.
- 1012 No refinement was used for this work, but it was sufficient for problem in hand. Possibility exists that by mistake of few acres here and a hundred or two hundred acres there totals on tables can be run high and the areas large. Think general tone of work was about same throughout area. Went over area hurriedly, but sufficiently to secure data sought.
- Do not see why, for practical purposes, stream measurements and records considered, work above Fillmore station would be eliminated in this proceeding. No records kept of amount of water used on upper ranches that I know of. Records obtained, say at Fillmore station, of flow of Little Laramie, would be flow after thou-
- 1013 sands of acres have been irrigated above. Have always made note in all tables made that there were large diversions above that did not represent productivity of drainage area. Bellamy canal is canal used by Lake James project for inlet ditch. Some irrigation takes place from canal along line, chiefly, on Blackburn ranch in vicinity of Mill creek. On Sec. 23, Tp. 17 N., R. 76 W. there are 175 acres pasture irrigated mostly from water flowing through natural depressions, water turned out above on other land. Would not call turning out of water on neighboring section to follow natural depressions onto other lands beneficial or economical application of water for agricultural crops; for pasturage it is different. Would

not call that economical application of water. Did not have  
 1014 to stretch imagination to get any irrigated pasturage on that section. Did not fail to credit 25 acres of oats and 8 acres of alfalfa to Section 24 where have given 240 acres pasturage, 10 acres of oats and 4 acres of alfalfa. In my judgment 240 acres irrigated pasture is correct. Don't recall that it took close scrutiny to determine irrigated pasturage. Irrigated pasturage distinguished by tracing out laterals and the running of water. Don't recall any laterals on Sections 24 or 23, other than perhaps some old laterals. Nevertheless gave Sec. 24 240 acres irrigated pasture. Did not include some lakes. Land included lies to southeast. Some seepage there probably. On Sec. 25 have no meadow. Have 20 acres  
 1015 of pasture. On Sec. 26 have no wheat noted. Have not 65 acres too much when 480 acres of oats noted. Think there were more than 62 acres pasture or meadow on Sec. 27 where I show 333 acres irrigated pasture. No note of laterals, were some. If one says there were 62 acres of meadow and pasture combined on that section and I say there are 378 acres, our judgments would be 316 acres apart. Think water from laterals can be distributed over most of section. Didn't pretend to make note of ditches. Didn't  
 1016 map them. On Sec. 34 note 270 acres pasture and 115 acres oats. I am sure there is irrigated pasture on that land. Main lateral from Bellamy ditch runs through. Water can be diverted either way from lateral. Oats on north side of lateral. On a small area there would be a variation probably as much as 10 per cent on acreages determined by my method as compared to instrument measurement. Do not think figures are 34 acres short of  
 1017 acreage oats on Sec. 35. Think I am not 240 acres in excess when I give 370 acres irrigated meadow and 200 acres pasture on Sec. 23, Tp. 17 N., R. 75 W. Don't know of 14.16 acres of oats. Have excluded lot between two channels Little Laramie River overgrown with sage brush. On Sec. 27, Tp. 17 N., R. 75 W., show 520 acres of irrigated meadow, 100 acres irrigated pasture.  
 1018 total of 620 acres. Recall some hummocks on south half of south half; don't know amount sage and greasewood land there. Fence cutting through there makes pasture and land on that class laps over in two or three places north of fence. In northwest portion are small areas greasewood pasture. Don't believe I spent an hour on this section determining acreage, but don't believe as much as 200 acres in error. Would be surprised if figures given for sec. 33, same township and range, showing 400 acres irrigated meadow evidently cut over this year; 215 acres irrigated pasture, making 615 irrigated acres total, were 75 acres excess on meadow and 215 acres excess on pasture. Don't know I am that far in error. Know there is some greasewood in there. Don't know time  
 1019 it took to go over section. Naturally careful plane table survey would be more accurate. I suppose exclusion more land classed as irrigated is matter of judgment. Each had equal opportunity on meadow where mowing machine had run. 75 acres discrepancy seems large. Do not think am 125 acres in excess on Sec. 35. There is fence cutting off south half. Lake in southwest

corner probably from irrigation, also another small lake in southwest corner.

While making these observations stayed one night at Centennial, two at Fillmore, one at Bass and one or two nights came to Laramie for gasoline. Mr. Titus went on account of knowledge of country and as witness. Had same system on Pioneer naturally carried it over on Little Laramie. On average spent nearly 12 hours a day. Cannot say covered 175 sections in eight days, have not computed

1021 them. It was a large area. If that many were covered it would be about 22 sections in 12 hours or about half an hour to the section. Drove on different portions of sections, some more than others. This method not as accurate as one employing a few hours to a day or more to a section. Might be discrepancies in deductions by my method and those of other method, based on judgment of surveyor. Naturally instrument survey would be more accurate. Would be surprised to find acreage by instruments much lower than that given. Do not know my calculations show 1022 thousands of acres more irrigated lands in Little Laramie Valley than are shown by careful instrument survey, but don't think it strange under circumstances if such should be the facts.

Redirect examination by Mr. N. E. Corthell:

1022 My testimony in cross-examination as to irrigation of Talmadge-Buntin project refers only to lands irrigated from the James Lake reservoir. I came here in May, 1912. Have no personal knowledge of amount in or run through James Lake Reservoir prior to 1912.

There are lands in Sections 10, 14 and 15, Township 16, Range 75, in the Bath Reservoir site. That reservoir is connected with the Laramie Water Company's system.

1023 Land formerly irrigated but not irrigated this year was purchased for that site.

1023 Recross-examination by Mr. Delph E. Carpenter:

Did not classify all land in Bath reservoir site as irrigated pasture. Portion under laterals where there were stack pens showing hay had been cut. It is not included in general tables, but in note at bottom referring to Poverty Flat ditch and is excluded from table. Lands under James Lake ditches more or less rolling with general slope toward the east. Irrigation would naturally produce a return flow of wastes into Laramie river east as soon as areas were of magnitude.

1024 In making observations of irrigated lands on Little Laramie noted acreages as I worked by blocking out areas in colors on the standard topographic sheet of U. S. Geological Survey, Laramie and Medicine Bow Quadrangles, scale one inch equals two miles. Deductions from these maps on small areas made by notes and computed areas in office from notes. Did not use planimeter in ascertaining areas from maps made in field. Used transparent cross-section paper to block out areas then computed area embraced in outline.



The cross-section paper had ten intervals to the inch each way, five spaces to the mile. Simply transferred areas from map to transparent paper.

Redirect examination by Mr. N. E. Corthell:

1025 I know the general physical and topographical features of the Laramie River drainage basin.

It is an oblong area of 4,472 square miles, 115 miles long, and of average width of 30 miles. 395 square miles of this is in Colorado, the remainder in Wyoming. The trend of its major axis is East of North. Laramie River flows North from Colorado, and toward the East in the lower end of the basin to its junction with the North Platte River. The southern one third of the basin is rimmed with high mountains, culminating in peaks 12,000 to 13,000 feet high in the Medicine Bow Range, and these mountains are the chief source of the water supply of the Laramie River. Along the East side of the drainage basin are the Laramie Mountains of average elevation of 8,000 feet, culminating in Laramie Peak of 10,000 feet elevation. Immediately west of the Laramie Mountains lies a semi-arid area of irrigable lands approximately 75 miles long and 20 miles wide, known as the Laramie Plains. The Laramie Plains are more or less rolling with gentle slopes and susceptible of cultivation and irrigation.

1026 East of the Laramie Mountains, at the lower end of the Laramie River basin are also large areas of arable lands along Chugwater Creek, Sybille Creek and North Laramie Creek. There are also small areas of tillable land along streams tributary to the Laramie River. The chief tributaries in their order down stream are Sand Creek, Little Laramie, Sybille, North Laramie and Chugwater. Little Laramie is the largest tributary and rises in the western rim of the basin. Its course is northeasterly to its confluence with the Laramie River at an elevation of 7,050 feet. The Little Laramie at its mouth has about 50% of the amount of water in the Laramie at Woods, Wyoming.

Sand Creek rises in Colorado and flows into the main stream a few miles above Laramie.

Sybille Creek, Chugwater and North Laramie drain chiefly the eastern slope of the Laramie Mountains. The run off from these streams is much less per square mile than the drainage from the Medicine Bow Mountains at the head of the Laramie River.

The mean annual precipitation at Laramie in the Laramie Plains area is 10.2 inches, at Wheatland 14.2 inches. In the mountainous portion of the drainage area in Colorado and Southern Wyoming it reaches as high as 40 inches. Elevations are as follows: The Laramie Plains, 7,000 to 7,500 feet; the Laramie River at the Colorado-Wyoming line, 7,675 feet; Laramie, 7,159 feet; Wheatland, 4,747 feet; the junction of Laramie with the North Platte, 4,250 feet.

1027 The soil of the Laramie Plains is chiefly from sand stones and shales of the cretaceous period, and produces naturally a native grass of large value from a grazing standpoint. Melting snow



from the Medicine Bow range in Northern Colorado and Southern Wyoming—the principal range of the Rocky Mountains in this region—is the principal source of the water supply of the Laramie River. The precipitation in these mountains is very much greater than that in the open plains country. This snow falls in the mountains from September to May, inclusive. There is no considerable supply to the Laramie River in Wyoming from the eastern side of the basin.

The greatest run-off occurs during the months of May and June.

1028 The Medicine Bow Mountains, and all mountains along the South and West boundary are heavily timbered. There are no trees on the Laramie Plains except along the beds of streams. There is sparse vegetation on the Laramie Mountains.

The tributaries of the Laramie in Colorado in their order are as follows: Down the west side, West Fork, Mill Creek, Fall Creek, Rapid Creek, Springer Creek, Rawah Creek, McIntyre Creek, Le Garde, Forrester, Grace, Stuck, Johnson, and a portion of Beaver Creek; Down the East side, Brinker, Porter Nunn, Deadman, a tributary of Nunn, Jimmie, and Sand Creek which enters the Laramie in Wyoming.

I have prepared a map of the drainage basin of the Laramie River and its tributaries which I produce.

Exhibit G.

The heavy pink line on the map shows the boundary of the Laramie River drainage area; the vermillion line shows the course of the stream. The other features as shown in the legend.

1029 I can testify that the boundary as shown on the map is correct, also the line of the Laramie River and the location of its tributaries. The ditches are located in accordance with the locations shown in the office of the State Engineer. I have checked them against other maps and from a knowledge of a large number of the ditches. Have been over the country shown frequently, and conducted surveys and made measurements and observations in regard to the streams and ditches.

The green tint on the map represents the old established irrigation prior to 1900, the yellow tint the developments since.

This map is generally a correct representation of the conditions.

1030 (Map marked complainants' exhibit "G".)

By Mr. Delph E. Carpenter:

To which exhibit G and the offer thereof in evidence, the defendants, and each of them, now and here object for the reason that the same is incompetent, irrelevant and wholly immaterial and particularly for the reason that the same is manifestly erroneous in this: That it seeks by artful coloring to establish priorities of water rights which the witness himself has testified in prior evidence are wholly beyond his knowledge and particularly in the error in said map in selecting the dates of 1900 before and subsequent to which large

areas are classified, when the evidence of this and other witnesses on behalf of the State of Wyoming heretofore adduced has shown that the dates of priorities of the larger areas marked on this map as subsequent to 1900 were in fact subsequent to 1908-9-10 and not earlier than those dates. Said map in that regard being evidently in error. Whether because said map purports to show large areas as developed and irrigated by solid colored portions thereof in green, which testimony of this witness and other witnesses has shown are yet only partially reclaimed. Said map being further contrary to the evidence in that it purports to show all of the lands so colored as irrigated and reclaimed, when in truth and in fact only a portion thereof are irrigated and reclaimed. And particular objection is made in that behalf of the Wheatland tract, which the evidence already adduced in this case in behalf of the plaintiff shows is only 50 per cent developed, whereas this map purports to show the full 60,000 acres of the original tract already irrigated and developed. Further, in regard to said Wheatland tract, that the evidence in this case already adduced by plaintiff shows that the portions marked yellow on this map, evidently referring to the Sibylle and Bordeaux tracts of the Wyoming Industrial Company were not initiated prior to 1908-9-10, while this map would infer that said development had been begun as early as 1900. And further as to that portion of the area marked yellow and shown as located west of Laramie City is misleading for that the same is wholly unreclaimed and the evidence shows in this case, has already been unreclaimed and the evidence map is misleading in that it purports to show irrigation, construction and development as early as 1900, contrary to the evidence. The same objection particularly as to that portion of the map marked yellow and noted as under the James Lake project. The evidence already adduced in this case shows the initiation of said enterprise as recent as March 29, 1908, and not as early as 1900, as shown on this map. And for the further reason that said map generally by the artful coloring thereof purports by evidence wholly immaterial and irrelevant to fix priorities. For the reason that said map does not show within the true boundaries of the drainage area all of the tributaries of the Laramie River. And for the further reason that considerable portions of the area marked yellow on the map purport to show irrigation development and at the same time the dotted lines, according to the legend on said map indicate that no canals are constructed for the reclamation of said lands, but are merely projected and still in the imaginations of men. For the further reason that throughout said map, both in Colorado and in Wyoming the areas are marked a green tint to exaggerate the actual irrigated areas.

Cross-examination by Mr. Delph E. Carpenter:

Am the same R. I. Meeker who testified before. My map, exhibit G, in error in notation in Tp. 10 N., R. 76 W. and along south line said township, where McIntyre ditch is indicated by heavy line, as

though constructed. Should be dotted line because ditch not constructed; only projected in conjunction with Glendevy reservoir site project. Is not projected by Colorado appropriators.

1033 Map showing extension of King ditch in Tps. 13 and 14, R. 75 W., shows completed ditch. Do not know whether or not some of the structures across Sand Creek are incomplete; ditch prism is complete.

Dotted line on Tp. 14, ranges 78 and 79 W., designated Bell Supply Canal No. 2, marked as a projected enterprise, indicates the canal upon which the Laramie Water Company has already done considerable construction for the purpose of bringing water from Douglas Creek over the Divide into the Laramie *Laramie* River, said Douglas creek being a tributary of the North Platte river. There may be some short sections on the Bell Supply canal that are completed, but you cannot show them on this scale on the map. There are a good many sections opened up there.

1034 Obtained information relative to tributaries of Laramie river in Colorado, and particularly on west side of stream, from various maps; one the exhibit in bill of complaint. Checked this against standard published maps such as Clason's and others. If error in map (Exhibit G) in that region, is due to errors in other maps. Found Government survey maps in this region lacking in details. Relied largely on other maps to get details anywhere nearly correct.

## (COPY OF COMPLAINANT'S EXHIBIT I.)

*Laramie River Run-off, 1912 and 1913.*

Run-off, 1912.	Acre feet.	Distribution.	Acre feet.
Laramie River at Pioneer Dam, near Woods, Wyo.		Pioneer Canal .....	17,703
Run-off Jan. 1 to Dec. 31 .....	207,000	Lake Hattie Res. ....	69,855
		All other ditches between Pioneer Dam and Two Rivers .....	29,802
NOTE.—Jan., Feb. & March run-off estimated as 8,300 acre feet.		Wheatland Reservoir No. 2 & intermediate ditches below Two Rivers .....	89,550
	207,000		207,000

Run-off, 1913.	Acre feet.	Distribution.	Acre feet.
Laramie River at Pioneer Dam, near Woods, Wyo.		Pioneer Canal .....	13,504
Run-off Jan. 1 to November 30 .....	106,600	Lake Hattie Reservoir. ....	28,470
		All other ditches between Pioneer Dam and Two Rivers .....	18,917
NOTE.—Run-off for period of Nov. 16 to 30, estimated as 1,788 acre feet.		Wheatland Res. No. 2 intermediate ditches below Two Rivers .....	45,709
	106,600		106,600

*Monthly Discharge of Laramie River at Pioneer Dam, Near Woods, Wyoming,  
in Acre Feet.*

	1912.	1913.	Means for 12 months.
January .....	.....	2,650	2,650
February .....	.....	2,355	2,355
March .....	.....	3,296	3,296
April .....	5,534	12,674	9,104
May .....	40,643	38,307	39,475
June .....	91,874	26,598	59,236
July .....	34,863	6,825	20,844
August .....	7,809	3,130	5,470
September .....	4,641	3,023	3,832
October .....	6,456	3,812	5,134
November .....	4,403	(a) 3,930	4,166
December .....	2,644	.....	2,644
Total .....	198,867	106,600	158,206

(a) Nov. 16 to 30, run-off estimated.

These records secured by the Laramie Water Company, R. I. Meeker, Hydrographer, Nov. 20, 1913.

(COPY OF COMPLAINANT'S EXHIBIT J.)

*Little Laramie River Run-off, 1912, 1913.*

Run-off, 1912.	Acre feet.	Distribution.	Acre feet.
Little Laramie River at Hattie Supply Canal #2 Dam, near Fillmore, Wyoming, plus volume diverted by Bellamy Canal. June 1 to Dec. 31 .....	68,874 24,793	Bellamy Canal and James Lake Reservoir .....	24,793
		Hattie Supply Canal #2....	14,053
		Ditches between #2 Dam and Two Rivers.....	17,245
		Wheatland Reservoir and intermediate ditches be- low Two Rivers.....	37,556
	<hr/> 93,667		
	93,667		<hr/> 93,667
Run-off, 1913.	Acre feet.	Distribution.	Acre feet.
Little Laramie River at Hattie Supply Canal #2 Dam, near Fillmore, Wyo., plus volume di- verted by Bellamy Canal. Jan. 1 to Nov. 30.....	46,051 12,310	Bellamy Canal & Lake James Res. ....	12,310
		Hattie Supply Canal #2, ditches between #2 Dam & Two Rivers.....	22,254
	58,361	Wheatland Reservoir & in- termediate ditches below Two Rivers .....	23,797
	<hr/> 58,361		

NOTE.—Nov. 16 to 30 run-  
off estimated as 600 acre  
feet.

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58,361

*Monthly Discharge of Little Laramie River at Hattie Supply Canal No. 2  
Dam, Near Filmore, Wyoming, in Acre Feet.*

	1912.	1913.	Means for 12 months.
January .....	.....	1,045	1,045
February .....	.....	1,000	1,000
March .....	.....	1,476	1,476
April .....	.....	3,909	3,909
May .....	.....	14,142	14,142
June .....	42,147	15,590	28,868
July .....	13,558	3,431	8,494
August .....	3,911	1,353	2,632
September .....	3,701	1,107	2,404
October .....	1,697	1,562	1,630
November .....	2,702	(a) 1,436	2,069
December .....	1,058	.....	1,058
Total .....	68,774	46,051	68,727

(a) Nov. 16 to 30 run-off estimated.

NOTE.—Run-off of Little Laramie River included and accounted for in storage tables of Laramie River Basin for 1912 and 1913.

R. I. M., Nov. 20, 1913.

(COPY OF COMPLAINANT'S EXHIBIT K.)

Laramie River Basin.

*Résumé of Stored Water, 1912, 1913.*

Wheatland Reservoir No. 2.

Storage.	Acre feet.	Storage.	Acre feet.
May 27, 1912.....	36,600	Nov. 18, 1912.....	43,000
May 27, 1913.....	67,700	Nov. 18, 1913.....	9,000±

NOTE.—1913, April 29, reservoir contained 76,000 acre feet.  
1913, May 3, First run of water from Reservoir commenced.  
1913, Sep. 28, Fall storage commenced in Reservoir.  
1912, Sep. 12, " " " " " "

Wheatland Reservoir No. 1.

Storage.	Acre feet.	Storage.	Acre feet.
Spring, 1912 .....	No record	Sep. 10, 1912.....	10,500(b)
Apr. 20, 1913.....	10,000(a)	Nov. 1, 1913.....	2,100

(a) Rough estimate W. S. 8.5 ft. below top of dam.  
(b) " " " 2.2 " " H. W. line.

James Lake Reservoir.

Storage.	Acre feet.	Storage.	Acre feet.
July 17, 1912....	G. H. 15.0—15,000	Nov. 25, 1912....	G. H. 17.3—18,400
Apr. 25, 1913....	G. H. 18.7—20,400	Oct. 30, 1913....	G. H. 18.2—19,800

NOTE.—1912, storage from Little Laramie River commenced about April 21.  
1912, storage from Little Laramie River ceased about August 3.  
1913, April 19, storage run from Little Laramie River commenced.  
1913, May 25, storage run from Little Laramie River ceased.

## Lake Hattie Reservoir.

Storage.	Acre feet.	Storage.	Acre feet.
Apr. 8, 1912.....	0(a)	Nov. 20, 1912.....	18,700
Apr. 24, 1913.....	19,400	Nov. 5, 1913.....	26,000
(a) 1912, storage from Big Laramie River commenced April 8.			
1912, storage from Little Laramie River commenced June 4.			
1912, " " Big Laramie River ceased October 5 and December 26.			
1912, " " Little Laramie River ceased August 10.			

No water run from Reservoir in 1912.

1913, storage from Big Laramie River commenced April 25.

1913, storage from Big Laramie River ceased June 13.

No water diverted from Little Laramie River in 1913.

1913, First run of water from Lake Hattie Reservoir July 13.

No water run from Lake Hattie Reservoir after September 26 on account of failure of Bifurcation Works North and South Canals.

R. I. M., November 20, 1913.

## (COPY OF COMPLAINANT'S EXHIBIT L.)

## Laramie River Basin.

## Summary 1912, 1913, Storage.

## Water Held in Storage Nov. 20, 1912, 1913.

## 1912.

Wheatland Reservoir No. 2, Nov. 20.....	43,500	acre feet.
" " No. 1, Nov. 20.....	10,500(a)	acre feet.
James Lake Reservoir, Nov. 20.....	18,400	" "
Lake Hattie Reservoir, Nov. 20.....	18,700	" "
Total volume in storage.....	91,100	" "

(a) Approximate.

## 1913.

Wheatland Reservoir No. 2, Nov. 20.....	9,000 ±	acre feet.
" " No. 1, Nov. 20.....	3,000 ±	" "
James Lake Reservoir, Nov. 20.....	19,800	" "
Lake Hattie Reservoir, Nov. 20.....	26,000	" "
Total volume in storage.....	57,800	" "

NOTE.—37,100 acre feet of storage carried over from 1912 in James Lake and Lake Hattie Reservoirs, and included in the total volume of 57,800 acre feet on hand November 20, 1913. Therefore, only 20,700 acre feet of the 57,800 acre feet represent 1913 storage.

NOTE.—These Storage Tables include all storage in Laramie River Basin except North Laramie Basin.

R. I. M., Nov. 20, 1913.



## (COPY OF COMPLAINANT'S EXHIBIT M.)

*Relation of Run-off Laramie River at Glendevey and Woods Gauging Stations.*

Values in Acre Feet.

## Laramie River at Glendevey, Colorado.

Net Drainage Area, Seventy-five Square Miles.

	1911.	1912.	1913.	Mean.	Mean.
May .....	15,096	12,600	12,342	.....	13,346
June .....	29,151	32,300	11,495	.....	24,315
July .....	8,144	16,400	4,465	9,670	.....
Aug. ....	2,323	3,300	2,201	2,608	.....
Sept. ....	1,571	2,200	1,833	1,868	.....
				<hr/> 14,146	<hr/> 37,661

## Laramie River Near Woods, Wyoming.

Net Drainage Area, Four Hundred Eighteen Square Miles.

	1911.	1912.	1913.	Mean.	Mean.
May .....	42,600	40,643	38,307	.....	40,517
June .....	58,100	91,874	26,598	.....	58,857
July .....	15,600	34,863	6,825	19,096	.....
August .....	7,190	7,809	3,130	6,043	.....
September .....	3,190	4,641	3,023	3,618	.....
				<hr/> 28,757	<hr/> 99,374

14,146

28,757 = 49% of run-off at Woods, Wyo., derived from water-shed above  
Glendevey, Colo., during July, August, and September.

37,661

99,374 = 38% of run-off at Woods, Wyo., derived from water-shed above  
Glendevey, Colo., during May and June.

NOTE.—Run-off at Woods, Wyo., for July, August, and September represents substantially the entire run-off of the Laramie River Basin except surplus from the Little Laramie River Basin in occasional years and inconsiderable amounts produced by summer freshets.

R. I. M., November 20, 1913.

Direct examination by Mr. N. E. Corthell:

1035 Since preparing table B, showing the run-off of the Laramie River, I have completed it to Nov. 30th, 1913, from actual observations down to Nov. 15, and from Nov. 15 to Nov. 30 estimated.

Produced and offered in evidence as Exhibit I.

I have also prepared a table showing the run-off of the Little Laramie for 1912 and 1913.

1036 Produced and offered in evidence as Exhibit J.

I have also a table showing a resume of the stored water in the Laramie River basin in 1912 and 1913 in tabular form.

Produced and introduced in evidence. Exhibit K.

I also have prepared in tabular form a statement showing a summary of the water that was in storage Nov. 20th, 1912 and 1913.

Produced and offered in evidence, Exhibit L.

These tables are from my personal observations except as noted on the tables.

1037 I have also prepared a table showing the relation of Laramie River at Glendevey and Woods gauging stations. This is based on records at Glendevey, Colorado in 1911, 1912 and 1913, and near Woods, Wyoming, in 1911, and at the Pioneer Dam in 1912 and 1913. The records for 1912 and 1913 at Pioneer Dam are my own measurements and observations. The 1911 run-off at Woods is from U. S. Geological Survey which maintained that gauging station. The 1911 and 1912 run-off at Glendevey is from the 16th Biennial Report of the State Engineer of the State of Colorado. The 1913 run-off at Glendevey I obtained from the office of the State Engineer of Colorado.

Table produced and introduced in evidence as Exhibit M.

1038 The tributaries of the Laramie River from the Colorado State line to the Pioneer Dam are Johnson, Beaver, Bear, Porter, Woods and Fox Creek. From the Pioneer Dam to the mouth of the Little Laramie they are Sand, Five-Mile, Harney, Soldier, Spring and Flood-Water Creeks and Little Laramie River. From the mouth of the Little Laramie to the dam for Wyoming Development Reservoir No. 2 the tributaries are Four-Mile, Wolf-Canon, and Wall Rock Creeks. From the last named dam to the Wyoming Development Co. Tunnel Dam, the tributary is Lost Creek. From the Tunnel Dam to the mouth of the Laramie River the tributaries are Salt, Slate, Cooney, Leeman, Sybille, Dry Laramie, North Laramie and Chugwater Creeks.

The Little Laramie River is the chief affluent of the Laramie River between the Colorado Line and the mouth of the Laramie.

Johnson, Beaver and Fox Creeks contribute a small volume of run-off in April and May. North Laramie, Sybille and Chugwater

Creeks contribute intermittently. The other tributaries may contribute water a short time during times of heavy rains but are extremely flashy and the greater portion of the year produce no run-off that reaches the Laramie River.

1039 During July and August, 1913, the Water Commissioner of the Laramie River stopped the diversion of water by the pioneer Enlargement on account of shortage of water. The latter part of September the bifurcation works failed in the outlet canal in Lake Hattie Reservoir interrupting the use of water in Pioneer Canal and also in North Canal. A delay occurred in the spring of 1913 in the Pioneer Canal at the intersection with the South Canal. There was a delay during the shortage of water in the latter part of the summer of 1913 due to the construction of a drop at the point where the south Canal goes into the Laramie River. This construction prevented the turning out at an earlier date of the stored waters of Lake Hattie Reservoir for the benefit of irrigators below who were in need of water because the flow of the Laramie River was very low at that time. A cloud burst interrupted the diversion from Wheatland Reservoir No. 2 in 1913, but that was a matter of only a few days.

1040 The drainage area represented in the run-off at Glendevy, Exhibit M, contains but a few more square miles than the area tributary to the collecting canals and tunnel projected by the defendants. The difference is about eight square miles. The Collecting canals take the drainage from 67 square miles, out of the 75 square miles which furnish the run-off at Glendevy. These eight square miles are below the defendants' collecting canals and are chiefly bottom lands and valley lands. The run-off in that portion is small compared with that tributary to the collecting canals which take the cream of the drainage area of the headwaters of the Laramie River. It is the high mountains which produce this large annual precipitation in the form of snow fall. The annual run-off in an average year is approximately 1000 acre feet per square mile.

1041 I am acquainted with conditions and methods of irrigation in various parts of Colorado. The conditions and methods of irrigation in the following places in Colorado are very similar to those prevailing in the Laramie River valley; namely, along the South Platte River in South Park; lands along Costilla River in Northern New Mexico and Southern Colorado; meadow lands on the headwaters of the Arkansas; meadow lands on the headwaters of the Grand River in Middle Park.

1042 Agreed that a printed copy of Exhibit H be substituted for the original and with the same effect.

Certified copy of adjudication of Laramie River and its tributaries offered in evidence. Exhibit N.

By Mr. Farrar: Objection on behalf of Colorado and all defendants to introduction of decree, Exhibit N, because defendants were not directly or indirectly parties to the proceedings in which decree was granted and had no particular right or privilege of becoming parties

and had no notice of the proceedings wherein said decree was granted; because the findings and decree is as to this case, 1043 *ex parte*, and in no wise binding on defendants or any of them; that same is incompetent, irrelevant and immaterial, and for the further reason that it appears from decree offered in evidence that same is not the final decree or adjudication relative to priorities of water on Laramie River and its tributaries, but, on the contrary, that an appeal has been taken therefrom and is now pending, and for the further reason that said decree, upon its face, adjudicates more than one water right for the same tracts of land and contains many inaccuracies and duplications.

Agreed that printed copy may be substituted for Exhibit N, subject to the same objections.

Certified copy adjudication water rights by Board of Control of State of Wyoming for priorities on Soldier Creek offered in evidence and marked Exhibit O.

Mr. Farrar: Same objection on behalf of defendants and each of them as made to Exhibit N.

#### 1045 Cross-examination by Mr. Fred Farrar:

The tables shown on exhibit M embrace an irrigation period. The flow during remaining seven months of the year not given. Referring to note at foot of page, exhibit M, the runoff from other tributaries, below Woods Landing, except the Little Laramie, is almost negligible part of general run off of the year. Regardless of my judgment as to whether or not they are negligible or substantial, there are tributaries that do, aside from summer freshets, furnish a small supply to river. Not a considerable flow in Little Laramie at all times of year. Exhibit J is correct. The note says "occasional years," in reference to surplus from Little Laramie basin. In

1046 note, Exhibit M, referring to surplus from Little Laramie Basin, mean that in majority of years there is little runoff contributed, in occasional years of extreme precipitations there is a runoff. In that note, refer not to total runoff of Little Laramie river, but to runoff during months of May, June, July, August and September. The note on Exhibit J does not apply for May and June. It states: "For July, August and September." Did not say that those quantities shown on exhibit J for three months mentioned were negligible. Runoff from Little Laramie basin, except these months, is substantially represented by table in "M," except during occasional years.

1047 Note in exhibit M refers specifically to these three months and covered general conditions. You were not supposed to take any specific year and apply that note. Personally acquainted with Little Laramie and Big Laramie rivers only two years, but have referred to older records. The note on Exhibit M, taken in conjunction with exhibit J, should include other years. It is a general statement. The records referred to were Wyoming records at Two Rivers station on Little Laramie river. Some are published, others not. Some of earlier records, those for years 1909-'10, secured

by state engineer I think not published, were taken into consideration in forming my judgment of this stream. The entire records secured those years are ones referred to as not published. Do not

1048 know why they were not published. No hydrographic records published in those years. Tables for year 1913 at Glendever, Colorado, shown on exhibit M obtained from state engineer of Colorado,—were not the final data as prepared for publication; checked over rating curves with measurements I made sufficiently to indicate their general correctness, also inspected Bristol record charts and took off and checked some gauge heights. Charts were shown me by Mr. Field, state engineer of Colorado.

Referring to exhibit L, showing two storage quantities held over at end of seasons 1912 and 1913, in Lake Hattie on November 20, 1912, 18,700 acre feet is active storage capacity. There is dead water in Lake Hattie in addition. Passive or unavailable storage is not considered in any of those. True also of 1913. In arriving at these figures, in some instances, have allowed for inflow based on records, excepting Wheatland Reservoir No. 1 in 1912. Exact dates of observation are given on table K, and where they disagree with that, allowance has been made for inflow from records, also inflow considered as equalizing evaporation. Wheatland reservoir was entirely exhausted in 1913, and for a time inflow ran through the reservoir. There are times before irrigation season, or in early part of irrigation season, when inflow is greater than outflow. Object of table is to show average carried over at end of year. It is subject to this qualification, reservoir is practically constantly refilling, to a certain extent, inflow and outflow simultaneously. Before that water failed there was some water temporarily stored, but all used for direct irrigation this year. There may be a greater inflow than outflow at times. On note, Exhibit L, have included Wheatland reservoirs No. 2 and No. 1, James Lake and Lake Hattie as all the storage on Laramie river basin, except North Laramie basin, have omitted Creighton lake and Hutton lake and numerous small basins and lakes scattered throughout plains, because do not consider them reservoirs. The Creighton lakes, or Hutton lakes, have no inflow from Big Laramie. They may have some inflow from Antelope creek. There has always been water in those lakes. Know of no water flowing into these lakes from Sand creek or Little Laramie river in 1912 or '13. Did not hear testimony by Mr. Hardman relative to Sand Creek water. I also omitted the Sodergreen lake, which is a reservoir, but no water has been carried over in that reservoir from one year to another. It is an equalizing reservoir for the Pioneer canal for short period; not been used in 1912 and 1913 to carry storage from one year to another. Some waste water flows into Big Basin but it cannot be withdrawn. Do not

1051 know of it being put in intentionally. Cooper lake not included properly in Laramie river basin because no flow or outlet from that to Laramie river. Know of no water withdrawn for irrigation.

Referring to exhibit K, based estimated storage capacity of Wheatland reservoir upon capacity curve prepared from areas taken from

contour map in state engineer's office, Cheyenne. Have a blue print copy of it. Storage capacity of Wheatland reservoir No. 1 is based on total capacity of reservoir as published in one state engineer's report, and certain data secured from Mr. Elliott, superintendent Wyoming Development Company. Observations notes in reference to Wheatland reservoir No. 1 made by myself. Under notes A and B, determined the elevation of water surface. Referring to exhibit K, showing that no water was run from Lake Hattie reservoir after September 26, because of failure of certain work, will state, water was needed for lands under the Pioneer canal and also for stock and domestic purposes. Very little needed for irrigation after that date, mostly for stock and domestic purposes.

Water was applied to lands under north canal on grass at that date. Was not there, but know that some was applied by Laramie Water Company. Have seen grass growing on the Laramie Plains as late as September 26. If fall is late and rains in September, it grows a good deal. Application of water in fall would help grass next year. If I stated this afternoon that no water was run to the Pioneer canal during July and August, 1913, was mistaken. were times when headgates at Pioneer dam were closed during those months, the only water that entered the canal was leakage through the gates of approximately two second feet; during those times water users were supplied temporarily from Sodergreen lake when there was water there, and largely from Lake Hattie through outlet canal. Gates were first closed on July 17, remained closed until morning of 22nd; again closed on 24th of July, remained closed until 30th; again closed on July 31, remained closed until August 5th; closed on August 10 and remained closed until 17th, inclusive, being opened some time on 18th; closed again on August 22, remained closed balance of month. Were opened on September 1st, closed on September 7, remaining closed until September 14th, and water was run then until September 29. This was done by order of water commissioner. Intermittent and regular opening and closing of gates permitted by water commissioner for temporary runs, to care for crops under Pioneer canal between Sodergreen lake and South canal. Some crops were suffering for water. That is above point of surface from Lake Hattie,—could not be served by any of existing canals from outlet. Pioneer canal itself that was closed. No water run into Lake Hattie through the Pioneer enlargement after June 13, 1913. That was date storage ceased. Order of water commissioner denied water from stream to appropriators of water under Pioneer canal. Pioneer canal not shut down previously since I have been here.

Am informed it was short of water other years.

The water was shut out of Pioneer canal in 1913 because needed for Wheatland project. Wheatland reservoir was full this spring (1913), at the time we stored that water in Lake Hattie. No existing working agreement between Wheatland people and Lake Hattie people relative to storage and distribution of water during past year or two. No agreement for reciprocation to avoid contentions between ourselves during pendency of this cause. Considerable



antagonism between two companies last year and this. Nothing specifically evidencing this antagonism, other than ill-  
1055 feeling when I arrived on project, not generated while I was here, but hung over from other years. Recall that gates of Pioneer enlargement were closed in 1912 by Wheatland Company. As to whether or not it has been our plan during 1913 and earlier to follow decree of district court shown in Exhibit N, relative to distribution of water on Laramie river, would say that when I came here there was no distribution, no method of measurement of waters diverted by the various canals up here, referring especially to Pioneer enlargement. I came here for the purpose of establishing gauges and measuring water, and to initiate and demonstrate the distribution of water. This has occurred only in a perfunctory way heretofore and we did try to work to those decrees this year.

Pioneer canal was shut down for benefit of Wheatland project, because the State Board of Control did not have a certified copy of last adjudication and it was necessary to go by tabulation published by state engineer's office of adjudicated rights on Laramie river, and that tabulation contains but a few second feet of the oldest rights of the Pioneer canal, which are prior to the Wheatland decree. The decree shown by Exhibit N has been signed and executed by the district court, but water commissioner takes instructions from state engineer and Board of Control and they didn't have copy of decree and went by the document they had. I wrote over in reference to that matter. The documents they had showed no rights in Pioneer canal, except a few earlier ones, which antedated the Wheatland rights. These particular earlier rights on Pioneer were not allowed to be supplied, headgates were closed. Action was taken by Laramie Water Company and appropriators of water under the Pioneer to secure rights which they were entitled to under decree of the court. I took the matter up with the water commissioner and also wrote the board of control and consulted Mr. Corthell, he took certain action. Did not succeed in getting certified copy to board of control. They refused to have copy made themselves; I made attempts to arrange it. Rather, I started to arrange for certified copy, but by that time it was so late we were able to use water from Lake Hattie reservoir, so we dropped the matter. I talked  
with clerk of district court in Cheyenne about it. He said

1057 they didn't make copies until money was paid. He asked \$70 or \$75. I went on advice of counsel. At any rate, certified copy was never procured. We lost water during short periods. Had all water needed in Lake Hattie for all land except above South Canal. Had no other use for that water except to irrigate Pioneer lands and those under North canal. We didn't use all water we had even for that. Lake Hattie reservoir designed primarily to serve north canal and extension thereof as well  
1058 as Pioneer. Referring to Exhibit J, cannot give amount of irrigated lands from Little Laramie river above Fillmore and amount below and between there and the junction. Exhibit J, first table, gives distribution in 1912 of Boughton canal and Lake James reservoir, 24,793 acre feet; Lake Hattie supply canal No. 2,

14,053 acre feet, next item, Wheatland reservoir and intermediate ditches below Two Rivers, 37,556 acre feet; Do not know how much of that amount is distributed to intermediate ditches between Two Rivers and Wheatland. No records were kept. The third item, ditches between dam of Lake Hattie Supply Canal No. 2 and Two Rivers, amount 17,245 acre feet, is the difference between amount of water at Two Rivers station and amount at number 2 dam during months of May, June, July and August. Don't know actually amount of land irrigated by that amount of water, the decrease between Two Rivers and No. 2 dam is very close to 30,809 acre feet between No. 2 dam. The amount mentioned distributed to these ditches is not a correct measurement, it represents the loss between those stations from irrigation and there is a large re-use of that water. Mean that on meadow lands of Little Laramie river water is applied copiously to meadow lands and returns to river and is undoubtedly used several times between the two points. This process continues indefinitely as long as water lasts. Same explanation would apply to table for distribution for year 1913 so far as covered.

Referring to third table on Exhibit J, have three columns of figures, first, the monthly discharge for June to December, inclusive, 1912, and from January to November 16, inclusive, 1913; the third column being labeled "Means for twelve months." Mean there based, in so far as months of January to May are concerned, entirely upon experience of 1913, because no other records. Have compared records of flow of water for a number of years on most streams in this vicinity. Am generally familiar with them. The flow for 1913 varies on different streams. On Little Laramie it was about sixty per cent of normal.

Table does not indicate correct mean flow of Little Laramie river at that point for a normal year. It shows on face that the mean is based entirely on experience for one year, so far as those five months are concerned.

Exhibit I, a similar tabulation to Exhibit J, applying to Big Laramie river instead of Little Laramie river, same explanation will apply, that is, the estimate of amount distributed to ditches between the Pioneer dam and Two Rivers during 1912, 29,872 acre feet, is determined by deducting from amount found at Pioneer dam the amount found at Two Rivers. On third table on that page, means for months of January, February and March, based entirely on experience for 1913, the only records on that point; for balance of months upon experience for years 1912 and 1913; except for December, 1913, have nothing to base my mean on except December 1912. On third column both Exhibits I and J, have used the expressions, "Means for twelve months," the idea was that means were shown for those periods for twelve months.

Testified that total drainage area of Laramie river down to a point at or near Glendevay, Colorado, was ninety-five square miles, but did not make a survey of area. It was taken from map of Laramie river basin prepared under my instructions. Data for its preparation taken from map in state engineer's office at Cheyenne also from map

of upper Laramie river in Bill of Complaint and two or three other maps that I don't recall. No survey made to determine actual area. Not customary to survey drainage areas to secure area of them, but use best maps, planimeter or best available information. If maps or data are incorrect, figures would be incorrect. Information was taken from map of Laramie river drainage basin in state engineer's office. Do not know by whom surveyed. Did not assume it to be correct but used other maps with it. These maps did not always coincide. Do not recall procedure in case of lack of coincidence. No survey made of land or drainage area tributary to Sky Line ditch of Water Supply and Storage Company which I testified amounted to fifteen square miles. Have been over portions of it. Same is true of area testified to as tributary to tunnel of Laramie-1061 Poudre system.

Exhibit M notes that 49 per cent of runoff at Woods, Wyoming, during June, July and August derived from watershed above Glendevev, Colorado: is based upon totals shown in tabulations immediately above where records embraced 1911-'12 and '13, for months of July, August and September, and the totals are 14,146 acre feet and 28,757 acre feet respectively. Make no allowance for water diverted from river between Glendevev and Woods Landing. Water diverted along the Laramie river between these points would be put on narrow shoe string meadow lands and a large amount of it, or the greater portion of it, would return immediately to the river. My knowledge of water sheds as dealt with in these 1062 two notes last mentioned on exhibit M not of a personal nature, but derived from maps mentioned, together with these measurements.

Wheatland reservoir No. 2 was full on May 11, 1913. Also inflow into reservoir after that time for storage purposes. Do not remember how long inflow continued in excess of outflow. A flood, testified to, occurred after May 11, 1913, between reservoir dam and the 1063 diversion dam at mouth of tunnel, a matter of a few hours. It took out part of the dam and occurred chiefly below Wheatland reservoir No. 2. I was not there at time.

#### Cross-examination by Mr. Delph E. Carpenter:

In direct examination stated that precipitation above Glendevev reaches as high as forty inches per annum and over a greater portion of the area is greater than 24 inches; that annual runoff in average year is approximately 1,000 acre feet per square mile. Obtained that precipitation of 40 inches from knowledge of similar high, mountainous area where records have been secured in Colorado. At station at Corona on Moffat road, 11,666 feet, it varies from 40 to 50 inches. In very dry years it may be less than 40. I also obtained data on Cumbres station in southern Colorado, about 300 miles south of headwaters of Laramie river. Do not recall record at that station, something over 40 inches. Also at Crested Butte, Colorado. That precipitation was over 40 inches. There is station at Long's Peak, 8,700 feet, I think that has a precipitation of some-

thing like 22 inches, but that is too low down to consider in this matter. Statement is based on general knowledge of high mountains' runoff. Think it best data on which we have to work. No station maintained up there on high altitude that I know of. Know of no observations at Chambers Lake.

1065 In distribution of water, common matter for water commissioner at times to shut down ditches. Administrative distribution of water in Laramie valley in years past has been more or less perfunctory. My information of valley was obtained in past two years from being over it; other than that is hearsay.

1066 Believe it customary for water commissioner to regulate ditches according to priorities. That is his duty by law. I spoke of interruptions occasioned by fixing certain structures, etc. Not uncommon for ditches to have interruptions for repairs during irrigation seasons. No particular stress need be placed on that feature, only interruptions in 1913 prevented use of water when needed badly. Am familiar with irrigation in other sections of country. It frequently occurs that breaks in ditches or structures cause temporary shutting out of water; it is to be expected. Not important unless interruptions cover extended period. There have been water commissioners who regulated Laramie river ditches at times. Can't give dependable table of water commissioners. During time I have been here, have seen and talked with water commissioners and informed of distribution of water by them in former years. Believe records of division engineer will show data. Think have seen some documents and correspondence at times in reference to those matters.

Since Lake Hattie project was constructed there might have been a little water from Laramie in 1911, but primarily first water was run in 1912. I am hydrographer for Laramie Water Company.

1068 Not especially familiar with details of all structures of company. Have seen them more or less. Had nothing to do with designing or construction.

Know of permits under which system of Laramie Water Company was constructed. Not familiar with number of permit for Lake Hattie Supply canal, application for which was filed by Z. E. Seveson, but know he filed one, about April 21, 1908. Do not recall exact dates on these filings. Have been through them and am more or less acquainted with them, but cannot give exact dates or numbers. Have copies of all permits in my office, issued to Laramie Water Company.

Believe Lake Hattie system built under permits, starting with No. 8612, filed by Mr. Seveson, and succeeding permits, 8612 being first application and filed on or about April 21, 1908.

(Witness temporarily excused to obtain permits and returning testified as follows:)

(At previous dates and particularly on September 3 and 4, Witness asked to furnish certain tables, as shown by testimony of those dates, also certain data and information.) Am now able to furnish information referred to without objection.

Mr. Corthell: I have no objection to furnishing that data.

(Witness furnishes following:)

Exhibit 18, showing monthly discharges of Little Laramie at Fillmore and Hattie Supply Canal No. 2 dam; exhibit No. 19, a table showing discharge of Little Laramie at Dougherty's bridge; exhibit 20, a table showing Hattie Supply canal rating station 400 feet below headgate. (All of said three exhibits being for the year 1912, and the said exhibits being marked at time purely for identification.)

1070 Will produce other information requested as same is compiled.

Have in my possession various permits under which Laramie Water Company's water system has been constructed or is building.

Examination by Mr. N. E. Corthell:

Have had time to go over matter and ascertain if these are all the permits affecting system; do not need additional time.

Cross-examination (cont'd).

By Mr. Delph E. Carpenter:

The numbers of those permits are as follows: 8518, 8519, 8520, 8521, 8612, 8613, 10,363, 10,364, 10,365, 1331 reservoir; 1372 reservoir; 1373 reservoir; 1883 reservoir; 2051 reservoir; 2052 reservoir; 1939 enlargement; 2113 enlargement; 2538 enlargement; 11,016; 11,017; 11,018; 11,019; 11,020; 11,021 and 11,022. 11,016 to 11,022 are attached to 2538 enlargement; 2719 enlargement; 2720 enlargement.

1071 These permits issued by State Engineer's office, Cheyenne, Wyoming. Do not include any filings or claims of Laramie Water Company outside state of Wyoming. Do include permits issued by State Engineer's office of Wyoming. Construction not proceeding under all permits; cannot tell off-hand under which ones construction is being carried on. Some earlier permits merged in later ones through enlargements and otherwise I believe. Refer to some of earlier permits in series, as shown by earlier numbers, original filings. In addition, to above permits, there are six additional applications not approved by state engineer. The inclusive dates of filing of these applications for permits on each of these series of numbers given above are 8518, June 19, 1908; 10,365, December 12, 1910; 1331, reservoir, June 9, 1908; 2052 reservoir, December 5, 1910; 1939 enlargement, September 18, 1908; 2720 enlargement, July 11, 1912. These dates are dates applications were filed in State Engineer's office rather than dates of permits themselves.

Redirect examination by Mr. N. E. Corthell:

1072 In the note on Exhibit M referring to the surplus run-off from the Little Laramie River basin, this term is used to designate the run-off of the Little Laramie at Two Rivers, or the point where it joins the main stream.

On Exhibit J the 37,556 acre feet run-off in 1912 and the 23,797



acre feet in 1913 distributed to Wheatland Reservoir and intermediate ditches below Two Rivers includes the return.

As the winter 1911-1912 was very cold and severe I believe the run-off for January, February and March, 1912 was materially less than for the corresponding months of 1913.

1073 There is no material difference between my map, Exhibit G, showing the upper portion of the Laramie River drainage area and the map attached to defendants' answer.

H. R. INGHAM, a witness in behalf of the Complainant.

Direct examination by Mr. N. E. Corthell:

1074 I am in the grocery and hardware and ranch business. Live at Laramie, and have lived in the County since May, 1877. Have engaged in ranching on the Little Laramie, on the lower part of the stream, for 29 years. Was County Assessor in 1888, '89, '90 and '91. Have been acquainted with conditions along the Little Laramie for over 30 years.

1075 Outside of the tract irrigated from the James Lake system there has been increase of several sections in the area irrigated ten years ago. This increase is chiefly in the extension of old ditches. Could not swear whether or not any new ditches built from the stream below the Sprague lane in the last 13 years.

1076 The Carroll and Halev ditch is the latest one I can recall and that has been there for 15 years.

My ranch is in Sec. 19, Town, 17, Range 74.

Quite a change has taken place in the last 15 years in the lands irrigated from the Little Laramie East of the Sprague lane through the old ditches that were there 15 years ago.

Very nearly all of Sec. 23, Town, 17, R. 75 has been irrigated 25 years to my certain knowledge.

1077 Section 24 for 30 years. Hay has been cut on all but 125 acres of it. I cut hay there myself 17 years ago. The 125 acres have also been irrigated.

At least 240 acres in Sec. 13 is irrigated land. Part of 1078 Sec. 25, T. 14, R. 75—nearly half of it, is irrigated land upon which hay is cut. I helped build a ditch there 29 years ago.

Section 26 has all been irrigated for 20 years.

The biggest half of Sec. 35 has been irrigated hay land for 20 years any way.

1079 About 125 acres in Sec. 36 has been irrigated for 29 years. Practically all of Sec. 18, T. 17, R. 74 has been irrigated at least 26 years.

Section 19 has been irrigated for 29 years.

All but 25 or 30 acres has been irrigated so as to cut hay for 16 years. It took about three years to get it so it would cut hay.

1080 All of Sec. 29 but about 70 acres has been irrigated for 15 years.

In dry seasons we have not had water enough for that Section.



All of Section 20 has been under irrigation for 15 years.

The most of Sec. 16 has been irrigated for 15 or 16 years.

Section 17 has all been under irrigation for 25 or 30 years.

About 600 acres of Sec. 8 has been irrigated for 30 years.

1081 There is irrigation on Sec. 9, but I do not know the number of acres.

I know they have cut as high as 400 tons of hay on Secs. 1 and 2, T. 16, R. 75.

There has been for 15 or 16 years irrigation in Secs. 7, 8, 9 and 10, T. 16, R. 74, but I could not state the amount.

On the lands in which I am interested we have raised alfalfa, rye, oats, wheat, potatoes, turnips, etc., when we had water to raise it with.

1082 We have also raised native hay, of which we cut about 800 tons this year and would have cut more if we had had the water. Our crops have been successful when we have had the water to water them with. We have been short of water nearly every other year ever since I can remember. It all depends on the amount of snow in the mountains.

The soil in the valley of the Little Laramie is a sandy loam, very gravelly. In some places we get a soil which we call gumbo. This makes our best hay land when the grease wood is grubbed out. Our land would produce nothing without water. The longer it is irrigated the more it produces. Most of the crops raised are fed to live stock. There is more profit in it that way.

1083 We irrigate the native hay and cut it and put it in stacks and fence the stacks.

After cutting the hay we run our live stock on the hay land and pasture it and haul out hay and feed them.

We also irrigate land on which we do not cut hay. Wherever there is water it makes good pasture. That is fed off without cutting. That is the most profitable use to which we can put this land and crops.

1083 Cross-examination by Mr. Delph E. Carpenter:

My ranch on Little Laramie consists of sections 19, 30, 29, 33, part of 20, Tp. 17, R. 74; 200 acres in 24, Tp. 17 R. 75, also sections 3, 11 and 13 in Tp. 16, R. 74, called dry sections. Think we have 5,240 acres of land in the ranch, of which 2260 is hay land.

1084 No measurement of hay we cut this year, estimated at 800 to 900 tons. All native hay. Did not cut quite as much hay in 1912 as in 1913, because native hay gradually increased in area every year and gradually increased in production. As land is watered from year to year you get blue stem, next year fox tail and it takes three or four years to wear that out and then wire grass, the best hay. Requires three or four years heavy irrigation to wear that out. Fox tail won't stand water many years. Think we cut more hay this year than previous. Hard to give number of acres of irrigated pasture on ranch. Could not intelligently swear to it, because it is in little corners where waste water gets on it and makes good pasture land. We could support more cattle than

we have on ranch; could winter 1000 head if we had them. We run from 500 to 700 head. Summer them between the rivers  
 1085 on high lands on open range. Cannot tell whether we get the best value out of our hay and crops by use of these cattle or not. They eat all our feed.

Did not raise any oats this year or last year. We farmed between 70 and 100 acres several years, and finally the water got so uncertain we stopped, because water went down last two crops during the irrigation season. During those two seasons we raised rye and oats principally, a little barley and few peas, just trying them out. Oats proved best crop to cultivate, next best was spring rye. Potatoes did not do very well, because water went down when irrigation was needed. Planted Early Rose and Early Ohio potatoes. Have never been bothered with frost on grain or potatoes. Did

1086 not know potato vines froze down at Agricultural College, Laramie, on July 30 or 31. Sometimes frost here and none there and sometimes a snowstorm out there only 12 miles away when sunshiny here. Have had snow storms out there in September. No serious frost in July to my knowledge. Have been here 37 years and think I have seen frost in July only twice. Have had only five or six acres of alfalfa on ranch. Estimated about three tons to acre from two cuttings. Never weighed alfalfa. First year we

1087 were very proud of it and measured it under old Strode rule, which prevailed among ranchmen; do not know what it is. Was told hay averaged three tons per acre; didn't measure it myself. I was at ranch almost every pleasant Sunday. They claimed we had five acres; never measured it. Continued to raise alfalfa until last three years. Haven't cut it for three years. Water has been so scarce last three years we have neglected to water it and used water where it would make hay. In 1902, irrigated same amount of land as today, but it was not all producing hay then.

Have three men to do irrigating.

1088 Keep water running as nearly as possible over whole tract while irrigating hay, it requires that on native hay. Run water until it stands over meadows in pools; have to because ground is so uneven. From distance meadow looks very smooth, but is uneven,—all the land is. Don't know any land in this country that is not. Meadow irrigation is entirely by flooding. We turn water off to dry up meadows about July 1st; some years turned off for us, all gone. In flush seasons, let it run to about July 5. As soon as ground dries, haying until freezing weather. Takes week  
 1089 or ten days to dry sufficiently to cut.

On bottom land, went ten feet below surface for water in well. Would not have to go far to obtain water under Little Laramie valley lands.

Little Laramie divides into two channels, Brown creek and Little Laramie proper through our portion of the valley. Channels unite again above Two Rivers; run about a mile apart for about nine miles. Land between these two branches practically all  
 1090 meadow land. When I came were prairie. Ties floated down stream; tie drives in spring, along in June, when water

highest. Land on ranch in Little Laramie valley is gravel, that is, sandy loam. Have two groups of ranch buildings. 1091 Besides hired man, there are seldom less than six persons living on ranch throughout year. Income of ranch is derived entirely from profit from handling cattle and horses, principally cattle. Run 65 to 160 head of horses; handled practically the same we do our cattle.

1092 Sold grain from ranch only one year. Requires our hay and pasture to carry stock through each winter. Rarely sell hay.

From 29 years' experience, have found this only profitable method on this ranch. Feed our stock on ranch from about middle of October for about eight months. Have lands for summer pasture, sections 33, 11, 13 and 3, and two leased sections open and used by everyone. Never start in winter without at least a ton of hay to the head. Don't consider it safe, from my 29 years' experience, to go into winter with less. Wouldn't borrow money to buy cattle unless we had that much hay. Cattle put on pasture land

1093 when brought in in fall; as this gets short, we feed hay.

Little Laramie valley proper from my place up to Centennial is, generally speaking, a stock and hay country. Our ranch is irrigated from Carroll and Alsop ditches. Also own some interest in Murphy ditch. We are down near lower end of Little Laramie river. Shortage of water has occurred nearly every other year for about twenty-nine years, depending on snow in mountains. Called on water commissioner to find water in 1911 and 1909, and

1084 about fifteen or twenty years ago we had a squabble there but could get nothing. Generally speaking, water commissioner does not regulate our headgate because no water. Can walk up and down stream without wetting your shoes some years. Don't think state engineer ever measured it when it was running, I would be surprised if shown that water runs every month out of mouth of Little Laramie at Two Rivers, I don't think it does. In spite of

shortage of water, it seems that they have let people go

1095 ahead and build large irrigation works taking water from Little Laramie river. Lake Hattie people have built inlet from Little Laramie river to Lake Hattie. They have not been

diverting water this year; can not say as to last year. The James Lake people built a large canal. Have heard they have been diverting water ever since 1909. Never tried to get water down from new projects, nor to have the water commissioner close down Lake Hattie inlet. No measuring weirs at heads of our ditches. Our dams are of rock, manure and brush. So far as I know, that is character of dams up and down Little Laramie. Poles and the like of that. Don't think irrigators have had more than needed in spite of fact each irrigator has been accustomed to helping

1096 himself.

No official going up and down stream regulating headgates and measuring out water to various consumers to my knowledge.

Banford and Craydon lived on sections 1, 2 and 12, Tp. 16, R. 75 near Big Basin. Irrigated and raised hay. Heard Banford say he

had 350 or 400 tons of hay. I think this year he said he had a hundred and fifty or two hundred tons. Didn't have enough water. All native hay. He is engaged in stock business same as rest of us. I don't know how many head of cattle he supports on ranch. Some hay is cut on sections 7, 8, 9 and 10, Tp. 16 R. 74, never measured it. Know only by seeing hay stacks and seeing him at work when we were haying. Has been irrigated ever since I can remember. Don't know from what ditch. Section 23, Tp. 17, R. 75 has been irrigated for 25 years. May not be all meadow, but is all irrigated. Am guessing that about 240 acres irrigated on Sec. 13, Tp. 17, R. 75 W. Greater portion lies on upland and north of Laramie Valley. On Sec. 31, Tp. 17, R. 74, only very small patch irrigated. On Sec. 30, Tp. 17, R. 74, all except about thirty acres has been irrigated. Carroll lake takes quite an acreage there. I count that as pretty well irrigated land. Of course, it does not produce crops. There is seepage lake northeast of Carroll lake. It dry-s up as soon as irrigation is ended. Not all Sec. 29 is irrigated meadow land. Some of it taken up with ponds. About half section 29 cut over this year.

1099 Balance was used for pasture. Some land formerly plowed not cultivated this year. Just part of Sec. 16 irrigated. About 120 acres on Sec. 18 can be irrigated. Have been ranching there for 29 years. If there is water for new projects, should be water for older ranches, but do not know reason we don't get it.

Redirect examination by Mr. John D. Clark:

1101 I think the Laramie Water Company purchased Sec. 16, T. 17, R. 74, from the State this year.

EDWARD HICKS, a witness in behalf of the Complainant.

Direct examination by Mr. N. E. Corthell:

1102 I live in Laramie. Have lived in Albany County 26 years. Was engaged in Ranching on the Middle fork of the Little Laramie River for 25 years up to last spring. I handled stock and raised hay and sold a good deal of hay. I had 837 acres of land and irrigated from the Middle Fork principally. Raised hay principally. I am acquainted with the irrigation on the North Fork, the South Fork and the Middle Fork of the Little Laramie, and also on the Little Laramie itself for three or four miles down below where the forks come together. The amount of land irrigated there on these streams is about the same as it has been for 15 or 20 years,—very little change in the last 20 years.

1104 Think there are only two new ditches that have been taken out in the last 10 years, one by Charlie Anderson which irrigates 160 acres and one by Dwight Smith which irrigates 80 acres. With that exception the present irrigation has continued since 1888. The crop raised is principally native hay, and a few small patches of grain, and some irrigated pasturage. The hay and pasturage is chiefly fed to live stock. That is a profitable way to use it. The people make their living that way.

## 1105 Cross-examination by Mr. Delph E. Carpenter:

Sold my ranch to Walter G. Decker, who used to live on Big Laramie river in Colorado, is a son-in-law of Oscar Sodergreen. Principally all of the 837 acres is irrigated except we have no water right for probably 90 acres. Lands I own are in sections 1, 2, and 35, Tps. 14 and 15, R. 78, bordering stream in mountain valley. Country back of valley is mountainous. Land that I and other ranchmen irrigate in that vicinity is narrow river bottom along stream. Irrigate through Hayes and Bird ditch, C. W. Hicks ditch and Hicks ditch No. 2. Bird brothers owned lower and upper Bird ditches. Now Mr. Geddes owns them. Irrigated about 400 acres sec. 35, from Hayes and Bird ditch. All native hay land. Irrigated 160 acres from C. W. Hicks' ditch. Sold forty acres, leaving 120 acres at time I sold out. Irrigated full 160 acres;

1107 native hay meadow land. Irrigated eighty acres, section 35 from Spring Creek ditch, native hay; about 140 acres from Hicks' ditch No. 2 in section 1, Tp. 14, R. 78; all pasturage. By 837 acres I mean that is what I owned and irrigated when I sold to Decker.

Cut between 400 and 500 tons of hay on the full 837 acres of irrigated land. Did not cut all over it.

Never ran many cattle, probably not over 150 on average. About 50 head of horses. Used ranch to support that stock. Made 1108 my living that way. Never ran my stock off ranch. Just my family and I lived there. It took this ranch to support my stock and family. Sold considerable hay. Sold 100 to 200 tons a year of late years. Bought land at different times. Shipped hay to different people, some to man in Cheyenne, some up in hills, hauled it up there.

Mr. Walbol at present also interested in Hayes and Bird ditch. believe John Bird has 40 acres under that ditch. Walbol must have 300 acres under it and Bird 40 besides my ranch. I have 1109 water right in Hecht ditch also. The ditch comes out of Spring Creek. Eighty acres under that ditch all native hay land. Hay from that eighty part of amount mentioned and 80 was figured in 837 given.

1110 Usually turned water into ditches about middle of May. When ready to irrigate, we opened ditches and turned water in and onto land; did not ask permission of water commissioner, simply took what we wanted. There was water there for us. Kept water running more or less constantly over meadows which are along and parallel to creeks. North of middle fork, meadows extend as much as 2½ miles from river; on south side, probably 2 miles; watered from middle fork. Then south fork comes in and takes rest of valley. General fall of land was with course of river.

1111 Custom was to keep water running constantly over meadows, keeping them wet all the time, in that way raised best crops of hay. Kept water in ditches until time for haying. Generally turned it off about July 10, but many ran later. My ranch—good hay ranch—produced better possibly than neighbors. Irrigation



water ran across meadows back immediately into stream from my place into South Fork. Sub-soil was gravel. Haying commenced July 25 to August 1. Employed twelve to thirteen men. In 1112 good weather, finished in three weeks. Two men to take care of ditches during irrigation. One man and self practically ran ranch excepting during haying. Haying nearly always through before last of August; bad weather sometimes delays us. If weather dry, meadows would dry in about a week after irrigation. Neighbor's land would dry sooner than mine.

Has no measuring weirs in ditch at headgate. We had no 1113 dams in the river; regulated water with rock dams and stone dams in head of ditches. Water commissioner up there two different times; Mr. Price was sent up four years ago. Mr. Jones 10 or 12 years ago, adjusting some ditches between a neighbor and myself; water was short. That was on Spring creek.

Hicks ditch No. 2 not built until 1900, one of later ditches in that community. Think commissioner did not regulate ditches on north, middle and south forks of Little Laramie river during time I was there. Spring creek was stream of smaller flow than other streams.

Native hay principally wire grass. Haying season commences about same time as in Laramie Plains. Mountain hay usually of superior quality to that of plains. Finer quality up above than it is below. Have held hay over when prices low. Usually

1115 fed this hay. Shippers prefer our hay to hay in valley. Best price I ever received was \$11 a ton on the car, baled. It is worth \$2 a ton to bale it and \$1 a ton to load it on car from my place. Loaded it right on the ranch. Net about \$8 a ton in stack. In first baling, no waste. Some later as stacks got damaged.

1116 We fed that portion. Have sold hay as low as \$9 a ton, baled, on the car. That would be about \$6 a ton net in stack. A ton of hay per head for winter is sufficient for cattle feed; seldom

1116 took a ton when good pasture. Used fields for roughage all winter. Horses run through winter on half a ton per head or less. If had all grown cattle, requirements would have been more than with the class of stock had. A calf will winter on about one-half a ton, will take one and one-half tons per head for a three year old steer in good condition. If not kept so well, less than a ton per head.

To sum up, used this ranch and its livestock as a means of making a livelihood for myself, wife and three children.

JOHN W. ERNEST, a witness in behalf of Complainant.

Direct examination by Mr. N. E. Corthell:

1117 I have been ranching since October 1898, on the Little Laramie River, about midway between its source and its mouth, in Township 16 in Ranges 75 and 76. We irrigated land for hay and pasture and raised and fed horses and cattle from the fall of 1898 to the summer of 1909.



1118 I was and am familiar with several of the ranches and their condition. Am County Commissioner. The extent of irrigation on the stream now is practically the same as in 1898, outside of the James Lake and Lake Hattie systems, the additions since then not being more than 1500 to 1600 acres in the aggregate. The crops have been native hay, oats, barley, some potatoes and gardens.

1119 The Blackburn farm adjoins me. They have three sections of plowed land, and irrigate additional lands for pasture, and also some alfalfa.

The hay raised is fed to live stock or shipped out. Cattle are pastured on the irrigated meadows to quite an extent.

1120 There is now about 30% of the cattle, sheep and horses in the Little Laramie valley of what there was 15 years ago. Attempts to sell ranches for farms have not been successful.

Of the property in which I was interested there were 7680 acres; of this 6900 acres were irrigated. I cut 3000 tons of hay in good years and from that down to 1500 tons in dry years. The difference of production in the different years was caused by the lack of snow in the mountains,—lack of water. About half the time ever since I came we did not have enough water to make a full crop.

1121 Cross-examination by Mr. Delph E. Carpenter:

My method of irrigating in Little Laramie valley was to raise headgates and turn water into ditches and spread it around through laterals to carry it over land. Idea was to secure as large a head as possible so as to flood meadows. Practice general on Little Laramie. Can not pull big loads through and across valley during irrigation season except on county roads, crossing valley. Little

1122 Laramie divides into three or four channels below my place. Little short ditches are built along valley to carry waters out of channels onto meadows. Probably fifty ditches between Filmore station and Two Rivers taking water from Little

1123 Laramie.

Blackburn ditch only one with measuring weir. Custom of appropriators to take water when wanted, as much as ditches would carry. Water from irrigation returned to stream and reused below. There were years we didn't have water to flood valley or irrigate it. From slight observation, would say we used a different method of irrigation from that of Poudre Valley in Colorado in Little Laramie valley. They were irrigating alfalfa and beets, different crops from ours, and so have to use different methods. On Box Elder creek near Fort Collins, they use our method. Generally our object is to run a large quantity of water over each meadow so as to cover ground with big head of water. The river

1124 (water) commissioner has appeared on Little Laramie River every time called on. He shut our Mammoth ditch headgate down in June 1901 for balance of season and several times during 1910 and 1912. Wouldn't say had river commissioner on river every year, but quite often. When Ingham and Pascal and some of them began making a fuss he would come up and shut our head-

gate down. Their ditches were junior to ours. I did not  
 1125 construct any ditches after I went there. Besides Lake James  
 and Lake Hattie projects, Reed Ditch was built in 1900.  
 Think Carrol and Ingham put in some little ditches and there were  
 one or two built up above Filmore, between there and the May  
 place. Don't know whether they were adjudicated or anything  
 more than taking ditches across the road. No work of any extent  
 done in the country since I came, outside Bellamy ditch and work  
 done to run water down to Lake Hattie.

Attributed falling off in production of live stock to purchase of  
 most ranches by speculators. Believe they did sell a lot of it, but  
 the people they sold to didn't come out and settle and many that  
 did went back again.

Little Laramie Valley is primarily a live stock country. My opin-  
 ion is we should do some farming in connection with pro-  
 1126 duction of native hay and raising of live stock, to get best  
 use of it. Lower meadows or first bottom should be strictly  
 native hay ground. Some years when prices low, live stock business  
 not profitable. The live stock industry is not now leading industry  
 of Little Laramie Valley. They are growing hay and shipping it  
 away.

This was good hay year, prices considered. General scarcity in  
 Kansas and Nebraska has made exceptionally good prices. Heard  
 they are getting \$12 a ton for good native hay delivered at Laramie,  
 baled, f. o. b. cars. Price of baling, \$2 a ton. Cost of hauling to  
 railroad depends on distance to be hauled. Net returns to ranch-  
 man probably from \$9 a ton down, in the stack, this year. My  
 large hay ranch used to cut from 3,000 tons down to 1500  
 1127 tons a year according to season. Never checked over to tell  
 definitely number of acres cut, but think probably 4,000  
 acres. We had a larger yield per acre on that ranch than in aver-  
 age Big Laramie Valley, but think about the same as rest of Little  
 Laramie Valley. Some places they planted timothy and got a larger  
 yield than native hay.

I figure that three quarters of ton per acre per year about an  
 average yield in good years on our best meadows; would be less in  
 poor years. We sometimes sow timothy in native grass to increase  
 yield; obtain best returns two years after seeding.

1128 Believe Basin Land & Livestock Company, our lessees, ir-  
 rigated about 400 acres out of the 760 we owned on Seven  
 Mile Creek. I sold it to that company in 1910. It was irrigated  
 in 1909 from Boulder ditch. Don't know how long before that.  
 I owned 6,920 acres on Little Laramie River. Of that about 6,500  
 acres was irrigated from following ditches: Hecht No. 1, Mammoth  
 ditch, Hecht and Farrell, Blackwater, Slough No. 1 and No. 2, the  
 Grow ditches No. 1 and No. 2, Jacks Ditch, and Corner Section  
 No. 3 ditch, McKimmel and Garden, Grant Ditch No. 2, Grindstone  
 ditch, and some other small ones.

1129 We irrigated about 6500 acres, but it didn't all get into  
 heavy native hay during my time, but it would if continued  
 to be watered from year to year. Would take several years to bring

it into a stand of grass yielding enough to cut for hay. We used that for pasture land. Never liked to cut anything for hay that yielded less than a half a ton to acre; did not pay. Had about 2500 acres irrigated land which I did not cut. Used all pasture for feed during winter months some years and on some years not. Had 1200 to 3600 head of cattle during winters, depending on what we were trying to do with them how much hay it took. Ordinarily a ton of hay per head would be enough for winter, but took more for full feeding for grown stock; younger animals less according to age and size. When I carried any stock over summer, it ran on ranges to north and south. First few years we had she-stock. After we sold them we bought steers and those that got fat enough to sell in the spring we sold off for beef on Denver market, others we carried over that summer on irrigated uplands and shipped them as they got in shape. Required about 40 pounds of hay per

1130 day for full grown animal to do that kind of feeding, more than a ton to head.

Many outside people bought hay and pasture. Usually measured hay in stack in the fall, and threw in pasture in fields and feed yards. Customary to allow 422 cubic feet per ton for native hay and 512 cubic feet per ton for alfalfa. When wintering cattle for stock purposes, we fed them through storms and grazed the rest of time.

Turned cattle on meadows from outside range in October

1131 and turned them back on range again about May 10th. Some seasons we had to feed more hay than others. I never raised any alfalfa.

Did my utmost to get all revenue possible from ranch. Believe I obtained more revenue from ranch during that time than has ever been obtained since I sold it. Had 160 acres in grain and some garden patches, but not more than that, although there was lots of good upland not adapted to hay. Had more that could have been plowed if wanted. The grain yielded from 50 bushels down

1132 to 30 bushels oats per acre. Never planted anything but oats. Had some barley over home, never threshed, but stacked it for chickens. Never tried anything but oats. Some claimed barley was better, but never tried it. Raised oats for feeding my own stock. Think Blackburn people shipped oats and sold them around, but, generally ranchmen raised only what they wanted for their own use. The Blackburn place has been cultivated and farmed more than any other place in Little Laramie valley. This is place I always show to prospective purchasers, land buyers. Is our best exhibit. Think Colonel Bell started to plow that in 1900, but it had been plowed from looks of it some years before by old Douglas-Willand-Sartoris Company, but think Bell started this last exhibition up there in 1900. Same Colonel Bell who had many

photographs taken of his crops; now deceased.

1133 They obtain two cuttings of alfalfa per year from Blackburn ranch; first cutting about end of June and last cutting about last of August or first of September.

Some new fences built since I came up here, but ranchmen have been using forest reserve in mountains for outside range more than

when I came up. Think there is as much open range as there was when I first came, taking it all in all.

Redirect examination by Mr. N. E. Corthell:

1134 The date of the priority of Mammoth Ditch is June 7, 1890. Priority of the Bellamy Ditch which irrigates the Blackburn ranch, Nov. 15, 1889.

The Haley ranch on the Big Laramie has about 70,000 acres, the Riverside on the same stream 32,000.

Recross-examination by Mr. Delph E. Carpenter:

1135 In spite of all efforts to colonize there has been considerable land sold, but very little actual settlement.

E. D. TITUS.

Direct examination by Mr. N. E. Corthell:

1136 I accompanied Mr. Meeker in all the inspection of the lands irrigated from the Little Laramie River and have examined the list of such lands, Exhibit E. I assisted in estimating the quantities. The table, Exhibit E, correctly describes the lands we found irrigated the present year. I have been acquainted with the region covered by these lands since 1876.

1137 Have been over it a great many times in different years. There is less land under irrigation this year, 1913, than there has been in years before. This is because land has changed hands and the parties that got it failed to irrigate this year. There has been a shortage of water in the last 20 years. The production of hay there has been large, from 18,000 to 20,000 tons maximum between the Fillmore Ranch and the mouth of the river.

1138 There have been extensive shipments of hay from there, and the production of hay there has been profitable.

I know of no ditches of size or importance taking water from the Little Laramie, that have been constructed within the last 15 years except the Lake Hattie and the Lake James ditches.

Cross-examination by Mr. Delph E. Carpenter:

1138 Meeker and I were out on days named on list, October 2, 3, 4, 7, 8, 9, 10 and 30. That was time consumed by Mr. Meeker and I in making a determination of acreage. No one else was with us except driver. Am acquainted with Ernest ranch. Can not tell amount of hay that ranch has produced one year with another. Have been over Ernest ranch number of times; put in dividing gates in their ditch known as Black Water ditch; never estimated amount of hay. It was one of largest ranches originally on Laramie River.

1139 Think Millbrook holdings at one time cut more hay than Ernest ranch. Besides two ranches, there were a number of small ranches between Fillmore and mouth of Little Laramie.

Coughlin brothers had large ranch, they hauled lot of hay to Laramie and carried good many cattle. Was not as large as Ernest or

1140 Millbrook ranches. Webb ranch west and north of Coughlin ranch, not as large as Ernest ranch. John Reid ranch and Deerlove ranch were cutting hay below Filmore. Do not know acreage of any of those ranches. Have given practically all of ranches above Ernest ranch on Little Laramie. Alsop's ranch 25 years ago put up probably 500 tons of hay. Lands on that ranch are better now than they were then. Portion of that ranch is now owned by Mr. Ingham. Could not tell amount of hay Ingham ranch produced.

1141 Do not think more land under irrigation there now than 15 years ago. Is as good hay ranch now as then, if not better.

1142 Stickney ranch adjoins Ingham. Do not think it would cut as much hay. Do not know the owner of much of that land. Wasn't looking for production of hay on Meeker trip. Know country, but land has been changing hands in last 15 years up in that country. Could not tell you how much tonnage was produced on that ranch just mentioned. Know of other ranches, but can't tell names. There was old Jack Fee ranch and old Sprague

1143 ranch. Fee had about half a section right on the river, I cannot tell you hay produced 15 years ago. Think heard old man Sprague say about 20 years ago that he cut 500 tons of hay. Cannot remember acres he cut. Can't tell production of hay on Bath ranch. Think there were more than 500 acres irrigated in Sprague ranch. There was also Judson ranch just below Ernest ranch. Was quite a large ranch at one time; probably sold out now in smaller tracts.

1144 By smaller tracts I mean 160 acres to a section. Fleming ranch cut hay; been noted as a good hay ranch. Fleming ranch, as I knew it years ago, when Fleming owned it, would produce more total tons hay than Ingham ranch. It has been cut up and owned by a number of people. Part is now part of Bath ranch. In Bath holdings and Fleming lands there would be overlapping. The Al Bath ranch and the Fred Bath ranch over on south side and irrigated by Poverty Flat ditch. They produced hay when they owned it. Pastured much that was not cut. When land irrigated first in this country for a year or two get good hay and then comes fox tail; you have to get rid of that, drown it out, and then you get good hay, and about the time they began to get good hay they disposed of that land, or part of it. Banforth ranch located 15 years ago on west edge of Big Basin. Gardiner's ranch in there too. Are right south of the Ingham ranch. Should judge Bamforth had 200 tons of hay there two years ago. Gardiner ranch not as good as

1146 Bamforth ranch. Would not produce over one-third as much hay. Have named about all ranches producing hay 15 years ago. Probably some I don't remember. There is old Abrams ranch, just below Judson ranch, next to Ernest, was small ranch. 25 years ago saw at least 125 tons of hay on that ranch. It was not as good 15 years ago as it was then. 25 years ago Abrams was running ranch himself; has been in hands of renters since,

they don't irrigate as well as a man will himself. Phil Mantel ranch was producing hay 15 years ago. It now produces about 800 tons of hay. Do not think it produced that much 15 years ago.

1147 Would be startled if told that, judging from testimony of men who owned best of these ranches hay production in general has been over-estimated by me 100 per cent. I never measured that hay up and down the valley to learn amount produced. Am pretty fair judge of hay in stack, but never counted stacks in Little Laramie Valley; wasn't out to do that. In inspection of lands under irrigation on Little Laramie river and in driving over it in a car, made an estimate from different points of view, that there were between 16,000 and 20,000 tons of hay in valley. They are shipping hay now. A man can't help but size up stacks if

1148 he is interested in hay at all, when he goes by them. Did not note down each stack; only measured the stacks with my eye. Would say they would run from 10 to 60 tons per stack. Noticed uncommon large stacks on Judson ranch; guessed at amount in it. Could not change my rough estimate made of tonnage of hay in whole valley. When I described Little Laramie valley as immense in production, I had in mind, for comparison, hay lands of Big Laramie river. Irrigation has been attended to with better results in Little Laramie River than on Big Laramie.

Ernest ranch on Little Laramie River about same as lands under Dowling and Bilderback ditches on Big Laramie. If anything, Ernest ranch little the best in production per acre. Don't think any difference between Ernest ranch and Riverside ranch for hay production. Fifteen years ago, think Riverside ranch better acre for acre. Ernest ranch a good average of Little Laramie hay ranches. No ranch of same acreage to compare with it.

1150 Coughlin or Fleming ranches probably, acre for acre, little better. Little Laramie has been better hay producing country than Big Laramie; produced on average a little more to acre than Big Laramie.

Many ditches in Little Laramie valley below Filmore. Use streams and little ditches combined to keep diverting whole river as near as may be out over floor of valley. From north to south, valley, as a whole, is reasonably flat with a fall to east; about fall enough to permit good flooding, with lots of water. Requires 1151 lots of water, because Little Laramie Valley is cut with sloughs, old river channels, all over from east to west, showing there is lots of sand and gravel underneath the soil. Water soon finds its way through, and the next man below diverts it from dam and uses it again, and so on down. Evidently hay lands on Little Laramie are old river deposit. River separates into several channels.

Are headgates on Little Laramie ditches between Filmore and Two Rivers, but think no measuring weirs at head of ditches. I put in, about 12 years ago, weir dividing gates in Blackwater ditch, but know of no measuring weir at head of ditch; never was any. Same is true all down valley. Is common sight to see one of river



channels dammed up entirely and all water going out in ditches. In high water, which lasts a short time in June, practically don't need any ditches. It runs over banks which are low and out through old river channels; by a little help in them it does pretty good spreading. Meadows are largely naturally irrigated by overflow for short time, but not sufficient to make crop of hay. Is common sight

for a short time, when irrigation is going on, to see various  
1152 sloughs, or ancient water courses standing full of water and flowing from one to another across intervening higher lands, so, to a casual observer, it looks like a country filled with little lakes and sloughs. Has been practice for each man to take as much water as his ditch will carry, so as to spread it over land.

No large ditches taken out of Little Laramie during last 15 years, except canals of James Lake and Lake Hattie projects; not many new small ditches, although some ranches have changed diversion of water the better to distribute it. Mr. Ingham may have taken out two ditches during winter of 1903 and 1904, but didn't see any large ditches that looked different from 15 years ago. Mr. Jensen and A. L. and Annie Hall have taken out small ditches east of Sprague lane, don't cover very much land. All ditches mentioned are east of Sprague lane. Old Carrol and Alsop ditch carried bulk of water onto Ingham land. Mr. Bell built one small ditch here  
about five years ago. May be Mr. Brown took out a ditch  
1153 since 1911. Ditches taken out by Carrie Porter in 1909 divert water from Little Laramie River above Filmore, taking supply that used to go down to lower valley.

Quite a demand for hay this year; considerable shipped out; price  
\$12 a ton, I understand, f. o. b. cars, baled. Vendor has to pay for cost of baling and transportation from ranch to railroad and  
1154 receives \$12 a ton gross; costs about \$1.75 to bale it and about same amount to haul and put it on cars. He receives about \$8.50 net per ton in stack. Bigger demand for hay this year because of drouth in eastern Colorado and Kansas and Nebraska and eastern Wyoming. Did not include in estimate of hay tonnage that produced above Filmore on Little Laramie and tributaries. Feeding and raising of hay quite profitable. Phil Bath and Fred Bath have made profit during last twenty years. Bath left here number of years ago, I understood with \$50,000 made in ranching on Little Laramie and came back and invested here again a few years  
1155 ago. Old man Pulse made profit on part of old Milbrook ranch and near Ernest ranch. Jack Fee made money on Little Laramie; Carrol and Ingham also. Ingham interested also in mercantile business. Don't think Ernest made money. The people are fairly well to do. Don't think any of these ranchmen sold their lands, that I have mentioned. They have been buying a little more, buying out smaller ranchmen. Bath people engaged in raising cattle, horses and hay. Some ranchmen used open range in summer time.

Paid particular attention to way these men handled their stock: am interested in stock myself, horses especially. The plunging of speculators in these lands did not tend to raise estimate of values in

my mind. Gave what I considered actual value. Believe average value of native hay meadow in Little Laramie Valley is \$40 per acre, based on what it will produce. It costs about \$1.75 per ton to produce a ton of hay, including irrigation, cutting, stacking and putting in shape for baler.

A. W. AUSPURGER, a witness in behalf of the Complaint.

Direct examination by Mr. N. E. Corthell:

1157 I have been ranching on the Little Laramie River since  
1907. Am interested in the Blackburn place, and Secre-  
1158 tary and Treasurer of the owner, the Laramie Development  
Co. The Blackburn ranch is in Township 17, Range 76,  
and originally occupied 6400 acres. About 1200 acres have  
been sold off. About 640 acres are occupied by tenants. The Com-  
pany itself cultivated 1000 to 1200 acres each year. Have raised  
wheat, oats, barley, rye, flax, potatoes, and some other crops.  
1159 Have had as high as 300 acres of peas. We had sheep,  
horses and cattle. Our production would be about the same  
as it is in Colorado, Nebraska, Idaho and other parts of  
Wyoming.

1160 As near as I can judge, Mr. Meeker's statement, Exhibit  
E, is correct so far as relates to the Blackburn properties.  
We had from 600 to 1000 cattle. We pastured them chiefly on irri-  
gated land that was not cultivated.

1161 Cross-examination by Mr. Delph E. Carpenter.

Came to Laramie directly from East, August, 1907. Have  
had direct supervision of this farm all this time. No farming  
experience in Colorado or Nebraska. Business in Illinois was buy-  
ing grain. Was raised on farm in Illinois near Bloomington. In  
Iowa I bought grain, also supervisor of a farm in Iowa for at least  
three years.

Blackburn ranch is irrigated by ditch known by three names,  
Bellamy, Loback and Loback extension. Can't remember  
1162 amount oats produced in 1908 or subsequent years; have  
no records. Have no records of exact acreage for this year,  
merely approximate acreage figured up from time to time, but this  
year not as close because a good deal of land was sold, and I don't  
know exact acreage different people had out. Can tell approxi-  
mately amount company had cut this last year. Have to trust en-  
tirely to my memory. This year company had 135 acres of oats.  
About 70 acres on S.  $\frac{1}{2}$  of N.E.  $\frac{1}{4}$  Sec. 26; about 30 acres on N.E.  
 $\frac{1}{4}$  Sec. 34; about 25 or 30 acres in S.W.  $\frac{1}{4}$  of Sec. 24.  
1163 Company owns threshing machine, operated under my direc-  
tion. The 70 acre tract of oats this year threshed 2382  
bushels by machine measure, and we allowed a ten per cent deduc-  
tion from actual machine measurements. We wanted to  
1164 give farmers good measure. Test weights out there showed  
about that result. 30 acre field in section 34, new ground;  
estimate about 750 bushels.

Think Mr. Moreland had about 3200 (2828) bushels oats machine measure. Allowance of ten per cent over would be proper there. Tests on this allowance showed it correct. In arriving at this conclusion, they measure out a certain number of bushels by machine and then weigh it. Standard weight was 32 pounds to bushel.

1165 Mr. L. B. Penton purchased S. E.  $\frac{1}{4}$  of Sec. 26 from company; had approximately 140 acres oats in 1913, a little wheat, five acres perhaps. As I remember, he had a yield of 4300 (3966) bushels, approximately, threshed by machine measure. In other words, to get production in bushels, at 32 pounds per bushel, I take the machine measurement and add ten per cent. Don't know what his wheat threshed, but it was poor on account of freezing out. He had a very thin stand and his wheat was sown in November last year, winter wheat.

1166 Mr. L. H. Humphreys, a tenant of company on N. W.  $\frac{1}{4}$  Sec. 35 had about 120 acres of oats.

M. M. Smith, a tenant, has about 130 acres oats, which threshed approximately 4,000 bushels, as near as I remember.

Will procure exact figures later.

(After recess).

1167 Mr. Wessell had two pieces of oats; total yield was 3,083 bushels. From the four or five acres on section 24, threshed approximately 136 bushels. Threshed 2828 bushels of grain for Mr. Moreland, grain raised by himself. This figure 2828 bushels should go in place of my estimate previously made of 3200 bushels.

All machine measured. My record for Penton property, S. E.  $\frac{1}{4}$  Sec. 26 is 3,966 bushels oats and 55 bushels wheat. Presume made same allowance for machine measure of wheat.

Records show Humphrey property threshed 3,293 bushels oats. M. M. Smith oats threshed 4,075 bushels, both fields. Mr. Moreland's tenant threshed 3297 bushels. Company also threshed 852 $\frac{1}{2}$  bushels oats from 30 acres in N. E.  $\frac{1}{4}$  Sec. 34. These are all oats threshed by our machine on Blackburn ranch this year.

1169 Had two small patches of potatoes, possibly an acre, on Blackburn ranch in 1913 for home consumption. Had no barley in 1913, no spelts, planted a few peas, but did no good; few acres macaroni spring wheat, don't know yield. In 1913 had about 4 acres alfalfa, also about 30 acres seeded on Blackburn ranch

1170 this year in addition. A tenant of company raised some flax this year, production, estimated, 5 and 6 bushels to acre, threshed 152 bushels machine measure. Have found oats best crop to sell.

Company have something like 1,000 or 1,200 acres of cultivated land. Can not give net returns to company. When company was farming on large scale, were practically feeding everything they raised. Had gross returns, 1909, from 70 acres that sold as high as \$54.20 per acre. Received about \$2 per hundred for 85 bushels of oats to acre. In 1912 our yields were exceptionally light, chiefly on account of unfavorable weather in September. Grain was badly

logged by snow storm, September 13, as I remember. We threshed, 1911, on S. E.  $\frac{1}{4}$  Sec. 26, from 145 acres, 8,287 bushels of grain; above average; some other grains besides oats. Some barley. Acreage was estimated. Poorest field that year, as I remember, was about 30 bushels to acre, but I can not give that absolutely. Crop was oats. Up to time we sold these lands, used what I considered good farming methods. Object was to sell the land,

Redirect examination by Mr. N. E. Corthell:

1172 The yield from our cultivated land this year was about 50% of that in 1909; about 50% of that in 1911; and about 75% of the best yields in 1910. This year, leaving out a few small fields, we had 27114 bushels.

Redirect examination by Mr. N. E. Corthell:

Included, in this 27,114 bushels production from a field called Chrystal ranch, which had 2603 bushels, in addition to fields mentioned. That field was on N. W.  $\frac{1}{4}$  and S. W.  $\frac{1}{4}$  Sec. 29, and on part of section 30. All in oats. Estimate the acreage at 1173 from 100 to 120. One field of grain was badly damaged by cattle.

Redirect examination by Mr. N. E. Corthell:

During time we have been farming Blackburn property we have been breaking up 50 to 100 acres new land from year to year and putting it in cultivation. The results given include production on new as well as old land, all average results.

1174 Recross-examination by Mr. Delph E. Carpenter:

Could not give gross expenses or gross returns of ranch each year.

1175 Complainants' Exhibit F, a letter mailed by Clarence T. Johnson, State Engineer of Wyoming, September 16, 1909, to D. A. Camfield and S. H. Shields, president and secretary, respectively, of The Laramie Poudre Reservoirs & Irrigation Company, and to the president, secretary and board of directors of The Greeley Poudre Irrigation District, offered in evidence subject to objection on ground that the same is immaterial and irrelevant, and upon the further understanding that said letter is offered and urged, not as competent evidence to establish any of the statements of fact or conclusions of law therein set forth, but that the letter is offered solely for the purpose of proving that such a letter was mailed and received and for no other purpose, and particularly not for the purpose of establishing any of the facts or statements therein made.

*(Copy of Complainant's Exhibit F.)*

The State of Wyoming.  
Engineer's Office.  
Cheyenne.

Clarence T. Johnston, State Engineer.  
Harry A. Patten, Assistant Engineer.  
Ralph D. Goodrich, Deputy Engineer.

CHEYENNE, WYO., Sept 15th, 1909.

DEAR SIR: Realizing fully the complications which arise after construction has been undertaken and money invested in an irrigation project where the water supply is inadequate, we are taking this opportunity to notify you that the water of the Big Laramie River and tributaries is fully appropriated in the State of Wyoming.

The adjudication of the Big Laramie River discloses the fact that at the time these proceedings were concluded by the Board of Control, 89,561.47 acres of land were irrigated from the main stream in 1903. Under the state law and established beneficial use, these lands require 1,286.95 cu. ft. per second; or estimating the irrigation at 120 days 300,000 acre ft. per annum.

At the time the adjudication proceedings were in progress much construction was under way and rights had then been initiated which could not be established under the general determination.

The records of this office indicate that construction is under way or completed since 1903, for the reclamation of 100,000 acres of land in addition to the area now enjoying adjudicated rights. This land will require 2 acre feet per annum and it would be impossible to serve the entire tract, if it were not that there is a certain volume of return water, because all of the use proposed is along the valley of the river.

Any further diversion of the waters of the Laramie River for use in irrigation outside of the drainage area of the stream would injure Wyoming appropriators. The State of Wyoming, with the proper Government authorities, has maintained measurements on the Laramie River for a long term of years. There are many years when the flow of the stream has been wholly inadequate for the Wyoming lands under ditch, except through the utilization of large volume of stored water. Reservoirs have already been constructed which store 130,000 acre feet of water from the Laramie River in Wyoming. Reservoirs are under construction which will store 75,000 acre feet in addition. When these reservoirs are completed, they will have sufficient capacity to store all the waters of the Laramie River during the season of minimum flow, and to reclaim all of the lands under these reservoir systems, it will be necessary to store water and hold it from one year to another, if we are to develop stable agricultural communities.

In addition to the area having water rights from the main Laramie River in Wyoming, an equal area is not supplied from the

tributaries of that stream. These are largely independent of the main stream, hence they are not made a part of this discussion.

You are doubtless familiar with conditions on Sand Creek a tributary of the Laramie River which has its source in Colorado. Several years ago an attempt was made to divert the waters of Sand Creek in Colorado, without regard to the rights of prior appropriators in Wyoming. Wyoming water users immediately secured an injunction in the United State Courts against this proceeding.

A diversion from the Laramie River, such as is contemplated, would ruin Albany County and Northern Laramie County as agricultural districts. The State of Wyoming will therefore encourage every move to protect the water users and to protect the interests of the State along this stream. This office is in close touch with the water users and this letter is written to assure you that should a diversion as is contemplated, be attempted, resorts must be had to the United States Courts for protection.

This letter is written in advance of construction, so that there may be no excuse advanced in the future as to ignorance relating to prior rights to use the waters of Laramie River in this state.

Sincerely yours,

CLARENCE T. JOHNSTON,  
*State Engineer.*

M. C. BROWN, a witness in behalf of the Complainant.

Direct examination by Mr. N. E. Corthell:

1176 I am 70 years old. Lawyer. Have lived at Laramie most of the time for the last 45 years, and during that time have been familiar with the irrigation and agricultural development and history of this part of the country, particularly within the Laramie River basin.

1177 I have been engaged in ranching in the '70s and other times, some 8 or 10 years. I was on the Big Laramie at Hutton's place and Alsop's place in 1868, and in the same year was on the Little Laramie at Phil Mandel's place. Hutton was then irrigating quite a considerable meadow between his place and Fort Saunders. Alsop and Mandel were irrigating small tracts. When it was discovered that hay could be increased by putting water on the land, irrigation increased.

1178 When the cattle business became important in 1873 and '74 the valley lands along the Laramie River between Laramie and Burg's place, about 30 miles was generally fenced, and a considerable portion was under irrigation. At one time I estimated the land under irrigation on the Big Laramie up to 1873 was 5000 acres.

The first large irrigation project was the Pioneer Canal begun in 1879, and water turned through in 1880. In 1880 that was completed down to a point opposite Laramie. In 1884 the capacity of the ditch was enlarged and irrigation became more general.

The next large ditch was the Boughton Ditch, constructed in the early '80s and later the Oasis. Smaller ditches were taken out by



ranchmen along the Big and Little Laramies for hay throughout the '80s.

1179 I visited the Fort Collins region in Colorado in 1870 or '71. There was a little irrigation there then in a primitive way, like that in Wyoming. Also at Greeley, Colo. about the same time irrigation was begun in the same way on a small scale. Men did not then know how to use the water, and their efforts for a few years amounted to little.

The early irrigation which I saw in California, Montana, Oregon and Washington was similar, experimental.

1180 The first irrigation in Idaho was in the Boise valley and was likewise primitive.

From these simple beginnings irrigation has grown into great importance everywhere in the arid country.

The ditches constructed and in use in later years are altogether different. The first ones were small and dug to the stream so as to catch the high water. As years went on and more water was taken out they found these old ditches high and dry and had to dig ditches anew.

1181 I was ranching at the junction of the Big and Little Laramie about 1870 or '71. The irrigation development took place from 1870 up to now, but was chiefly prior to 1900. The increase since 1900 has not been large. There are some large projects under construction on Rock Creek. I also know of the James Lake and Laramie Water Company and Denver Laramie Realty Company projects.

1182 Rock Creek is not a tributary of the Laramie, but runs into the Platte.

I have frequently traveled over Wyoming, and become familiar with its irrigation projects.

1183 I was in California from 1860 to '62, then in Oregon, Washington and Idaho. The irrigation in all these states then was practically the same. It was experimental and very primitive.

1184 The irrigation in California and Colorado has since become quite extensive. The irrigation in Washington is not as extensive as in Wyoming.

The progress of irrigation in the Laramie Valley has been about the same as in the other states mentioned.

Very little was ever grown in the Laramie Valley without irrigation. Some little hay was cut before, but irrigation has increased it many hundred fold.

1185 As men found they could grow crops, the population increased. If the irrigation were withdrawn the valley would return to the same conditions as existed before there were any settlements here.

1186 Cross-examination by Mr. Delph E. Carpenter:

When toward Fort Collins in 1870 did not visit valley of Boulder Creek and Platte River valley between Denver and South Platte

cañon. First time I passed up Platte Valley and through Greeley was soon after railroad was completed from Denver to Cheyenne. Know nothing of early development on either Boulder creek or Big or Little Thompson creeks, or South Platte Valley above Denver until time I speak of. From Evans, of course, into Denver, was easy to observe condition of irrigation through that country in passing. If there were flour mills in that section of the country as early as 1868, on Boulder Creek and South Platte river above Denver, I did not know it. My acquaintance with irrigation prior to that time was mostly north and west of Wyoming and in Wyoming. When I spoke of many hundred-fold increase in production by irrigation, referred to irrigation of lands prior to that time wholly arid. Much same sort of lands that are now used for grazing in this section. Meadow lands differ in quality somewhat from the rolling lands and those on the second table. Meadow lands are mostly an alluvial soil along river bottoms. Prior to irrigation they would have been  
 1187 classed as grazing land. If it were possible to wholly withdraw irrigation from Laramie River Valley, meadows would return to primitive condition, grazing land. You might as well turn them over to the Indians, I think. Perhaps my opinions are somewhat strong on that subject, but I think that if conservation conditions had been practiced in this country in 1850 as practiced now, this whole country west of Missouri River would have been practically in hands of Indians yet. These conservationists would have had no basis for their argument had it not been for the fact that long before they dreamed of such a thing, the whole country had been largely developed. It is undoubtedly a fact that these same conservationists are largely claiming credit for development that they never heard of or thought of at the time it took place. My own opinion is that conservation has not increased development to any extent, but retarded it, conservation as practiced by our general government. The great development of the country has unquestionably come about through the individual effort of the settler or the efforts of a community of settlers.

Have observed climatic conditions of Laramie Plains and  
 1188 Wheatland section for number of years. Think seasons for growth in Wheatland are trifle longer than along Laramie Plains. At Fort Collins seasons are very much longer than in Laramie valley, both in latitude and altitude. Growing season in Laramie valley is comparatively short. Certain crops can be grown as abundantly in Laramie valley as anywhere else, but they are crops that are grown rapidly. Grain of some kinds grows in Laramie Valley abundantly. Think I have seen larger returns in oat crop in Laramie valley than I ever saw anywhere else. Doubt whether we could count on a crop of over 35 or 40 bushels of wheat to acre. In oats 115 and 120 bushels to acre have been grown. Barley and rye grow successfully. Peas grow very successfully. Alfalfa has a fair growth, not as large as you get in Colorado.

Redirect examination by Mr. N. E. Corthell:

Interested in cultivation of apples here in my yard in Laramie

City. Have been successful in cultivating apples here in a small way. Have a few trees in my yard and have grown apples very abundantly of their kind, for ten or fifteen years.

1189 Recross-examination by Mr. Delph E. Carpenter:

The variety grown by me is Transcendent Crab, an apple of very rapid growth, maturing fairly early and growing very abundantly. Have had to prop my trees up every year to keep them from breaking down. Mr. Ivison, right across the way from me, grows an abundant kind of apples. Very few people in this section that grow apples. Mr. Lund on Laramie river has an acre or two, in apple trees that bear bountifully,—nice apples. Mr. Ivison, in his yard right across street from me grows a regular apple every year. I have never tried that. Only experiment I have made has been with crab apples. In 1913 I gathered from one tree over 300 pounds of apples. Was a good apple year for variety of apples that I grow. 1912 was just about the same. Apple trees bloom the early part of May. I harvest my Transcendent crabs about first of October.

GUY H. DAYTON, a witness in behalf of the Complainant.

Direct examination by Mr. N. E. Corthell:

1191 I have been deputy county assessor for Albany County off and on for about 9 years.

The total assessed valuation for the County for 1913 is \$15,307,-848.89.

There were 2,925 taxpayers in the Laramie Drainage basin in Albany County in that year.

The number of land owners assessed for taxation in the basin and outside of the City of Laramie in 1908 was 778. In 1913 it was 1178.

1192 The market value of the lands in the Laramie River drainage basin in Albany County at the present time is \$9,500,-000.00.

According to the United States census the population of that basin in Albany County in 1910 was 10,317.

1192 Cross-examination by Mr. Delph E. Carpenter:

Last figure includes population of Laramie, a trifle over 8,000 inhabitants. Ascertained population of Laramie river basin in Albany county by taking poll books for years 1910 and 1912, found number of votes cast for congressman, and number of people living outside boundaries of this drainage basin and prorated it. Used poll books for basis of getting proportion of population in Laramie River basin as compared with population of whole county. First con-

1193 nected with the assessor's office in 1904 or '5. State Board of Equalization fixed assessment on railroads, car lines, telephone and telegraph lines and all public utilities. Our law calls for actual values as the basis of assessment on real estate. There are

808,056 acres of assessed land in entire Laramie River basin.  
 1194 Assessed valuation per acre in 1913 on average in Laramie River basin was approximately \$4.52, inclusive of improvements.

The total assessed valuation of property, Albany County, 1913, is \$15,307,848.89. Assessed valuation of railroads and other public utilities for 1913 in Albany County, fixed by State Board of Equalization, was \$5,114,040.89. Assessed valuation of all property in the city of Laramie for 1913 is \$4,138,763. Assessed valuation of property in other towns and municipalities in Albany county as follows: Town of Wyoming, \$5,435; Centennial, \$825 for lots and \$3,250 for improvements; Bosler, \$11,760, improvements, \$4,445. Rock River \$32,305. This major figure of \$15,307,848.89 includes improvements. The total live stock valuation is \$1,370,996. Deducting the total values that I have just given you from the original figures of \$15,307,848.89, it leaves \$4,626,029. The value of all other personal property in Albany county, other than live stock, is \$1,275,887. The valuation for 1913 of all lands in Albany

1195 county outside of city property and town lots, is \$4,126,990. Now, in addition, I presume there is some property sold for taxes, not appearing in the 1913 valuation, the property sold for taxes is \$56,040. Valuation of all lands outside of city property and town lots, would accordingly be \$4,183,030. Figure of \$4,626,029 formerly given is nowhere near valuation, because, as we talked before, on account of corporate property of town of Laramie being in that derivative figures of \$4,626,029, given by me, do not really represent any significant result, owing to the method by which this result was reached, figures which were taken to make it up in several cases including duplications.

Value of all improvements on all lands in Albany county outside of city and town lots is \$626,085. These improvements consist of fencing, buildings, reservoirs, and canals. Land figures represent naked land without any improvements. We classify our lands into seven classes: cultivated, uncultivated, grazing land, coal lands, timber lands, mineral lands and mineral reservations belonging with grazing lands. Cultivated lands include lands plowed and which have grown crops. Uncultivated lands are meadow lands. Grazing lands, just common grazing lands and irrigated grazing lands. These three classes, cultivated, uncultivated and grazing, subdivided on assessment schedule but not on assessment roll. The standard valuation on cultivated land is from \$22 to \$25 per acre, according to locality. The lands of Mr. N. E. Corthell are classified as town lots and assessed at \$35 to \$36 per acre. Valuation of meadow lands varies from \$15 to \$25 an acre, according to location and proximity to town of Laramie, productivity and other things. We never use it, but it is understood that there are first, second and third classes of meadow lands. We have a basis of figuring production of hay per acre on meadow land. If it produces over three-fourths of a ton of hay, it is first class meadow land and so on down. Valuations on grazing land runs from \$1.25 to \$10 per acre. Irrigated grazing land is assessed

from \$5 to \$10 an acre. Lands between what we term the two Rivers, are assessed at \$3 per acre, that is, the native grazing land. The northern part of county is assessed at \$2 an acre, and grazing land in the hills is assessed at from \$1.25 to \$1.75. Only two tracts in county assessed at \$1.25 per acre.

There are 1,114,903 acres of land assessed in entire county; 9,899 acres cultivated land, 53,543 acres uncultivated land, 1,044,092 acres grazing land, 80 acres coal land, 1,570 acres timber land, 5,712 acres mineral land. 545,912 acres of mineral reservation. The latter is just the mineral reservation on land sold by Union Pacific Railroad and is included in areas of other classifications. Figures of mineral reservation land are really duplication of figures 1198 in other classes.

The 808,056 acres assessed land in Laramie River basin are classified as follows: cultivated lands, 7,078 acres, valuation, \$153,670; uncultivated lands, 46,488 acres, \$887,314; grazing land, 745,502 acres, \$2,168,581. In addition there is the property sold for taxes, cultivated lands, 98 acres, \$1,670; uncultivated lands, 590 acres, \$8,850; grazing lands, 8,300 acres \$45,520.

When I spoke of number of land owners in county in 1908 and 1913 I referred to taxpayers. I might explain that in 1908 a man owning land in different school districts was assessed in one 1199 school district, when the law was changed in 1909 they were assessed in all school districts, so that a man who owns land in one or more school districts is termed a taxpayer in each district. Did not make a deduction of duplications in this way in arriving at my figures of 1178 land owners in 1913. That figure includes the duplication. If a man owned land and paid taxes in three school districts, his name would appear three times. Stated that there was an increase of 400 land owners between 1908 and 1913. Increase was obtained partly by adding some 65 or 70 names where lands sold for taxes, that have been added to the others. This figure, 1,178, includes duplications and also owners whose land was sold for 1200 taxes. The figures 778 for 1908 do not include any duplications.

Redirect examination by Mr. N. E. Corthell:

1200 The assessed value of the lands is about 70% of the market value. The improvements are assessed separately from the lands. The assessment for improvements does not include irrigating ditches, except those that are common carriers, such as Pioneer Canal and Wheatland Company, which are separate from ownership of land.

1201 Recross-examination by Mr. Delph E. Carpenter:

Irrigation ditches and reservoirs, connected directly with land as appurtenances, as in case where a farmer or rancher has a private ditch, are assessed and taxed with the land. The fact that these lands have these ditches and reservoirs appurtenant to them gives to the land its increased valuation. In figuring valuations of culti-

vated and uncultivated land and irrigated pasture, both land and water-rights are included in term lands. On irrigated pasture land, ditches, reservoirs and water-rights connected with the lands give an additional valuation as compared with grazing lands without water-rights.

Assessed valuation of lands actually equals 70 per cent of real valuation. The law requires assessment for actual value.  
1202 The market valuation of \$9,500,000 for lands in Laramie River basin in Albany county does not represent assessed valuation. It is 43 per cent above assessed valuation. That assessed valuation includes lands, lots and improvements on lands, and lots within drainage basin. The method stated was the sole method of arriving at my figures as to actual market value.

ROBERT J. COWPER, a witness in behalf of the Complainant.

Direct examination by Mr. N. E. Corthell:

1203 I have lived on Soldier Creek, a tributary of the Laramie River for 20 years. 1185 acres of land are irrigated from Soldier Creek. These appropriations were all made between 1870 and 1889.

1204 The flow of the stream is  $2\frac{1}{2}$  feet. Practically no water from that stream has run into the Laramie River during the years I have lived there.

1204 Cross-examination by Mr. Delph E. Carpenter:

By  $2\frac{1}{2}$  feet, I meant  $2\frac{1}{2}$  cubic feet per second. Call that constant normal flow of that creek. It comes mostly from springs. The fish hatchery is located at upper end at the springs. There are strips of land along creek that are irrigated.

ASMUS FRANZEN, a witness in behalf of the Complainant.

Direct examination by Mr. N. E. Corthell.

1205 I have lived in Albany County 20 years and just across the line in Carbon County 5 years additional. I worked on the Boughton Ditch cleaning it out and repairing it in 1889. We irrigated from that ditch in 1889. We plowed up quite a little land and put in oats under the ditch.

1206 The ditch irrigating the Ghost ranch came out of the Boughton Ditch on Sec. 27 and ran up into Sections 21, 22 and 16. It took in all up to the river. Part of it was used on the Willan land.

1207 The water all came out of the Boughton Ditch. Besides that all the land was irrigated down to the lake and over to the bluff. All that was irrigated in 1889. The amount irrigated from that ditch in 1889 was the same as that irrigated now. I sowed about 150 acres of that land in oats in 1889 and the oats was a good crop when I left in July.

1208 There was also 800 tons of hay raised there that year. I have seen 1200 tons of hay cut there. The crops and hay



were produced by irrigation. The land would not produce hay without irrigation.

Cross-examination.

By Mr. Delph E. Carpenter:

I left that year before harvest of oats. Can't tell you how many years after that they raised oats on the place; according to my idea, they plowed up 500 or 600 acres and put it in timothy. Three years later was there for a few days, and they had all that timothy there. They put it in oats first and then in timothy. In this country if not reseeded, timothy naturally dies and land goes into wild hay again. Frequency reseeding required depends somewhat on soil. Have seen ground, for instance, this rich soil on Shell Creek on Goetz ranch, hold out well, but at Bosler it gives out in about 5 or 6 years if not reseeded. They allowed timothy to be substituted 1209 by wire grass. Perhaps wire grass better than timothy.

Ranch used many years for native hay. Is best adapted to raising native hay. Have seen as high as 1200 tons of hay on that ranch, in 1908.

The irrigation went down towards the lake. Water from Boughton ditch wasted off meadow and snow and made that lake. Cannot tell number acres of hay meadow on ranch, probably over 1,000 acres. I quit before close of irrigation season. During irrigation, had eight or nine men with me for a while. Do not know 1210 yield of oats produced, it was a good crop. I sowed it all by hand. They didn't have any seeders those days. Am now ranching at Rock River.

JACOB HERBST, a witness in behalf of the Complainant.

Direct examination by Mr. N. E. Corthell.

1210 I have lived in Albany County, Wyo., since 1884. Engaged in ranching and riding on the Laramie Plains. I know the Boughton Ranch. Worked there from 1897 until 1911.

1211 Helped fix ditches up, built dams, etc. All the land under the ditch was irrigated then. The water flowed generally in a westerly direction from the main ditch. We grew some alfalfa and oats besides hay; 75 to 100 tons of alfalfa on 40 to 50 1212 acres.

About 65 to 85 acres of oats. The crops were fairly successful, nothing extra. Also raised native hay every year. The ranch was a cattle ranch.

Sometimes after the water was all out of the mountains we had to dam up the river to get out more water. Generally we had enough. We had a dam in the river, and during the time I worked there changed the location of the dam to a point a mile further up the river than the old dam.

1213 The old dam was crib and rock. At the new one they piled sand bags in the river when it got low so as to turn the water into the headgate.

## 1213 Cross-examination.

By Mr. Delph E. Carpenter:

During years I worked on ranch I cut from 900 to 1200 tons hay. Can not give number acres. We turned cattle off meadow about first of May, so as to get the water on. Started haying July 20. We would turn water off just about a week before cutting.

The water in river here is cold water, terribly cold on an average. Mountain trout live in our ditches and go out on meadows.

I did not use over two men irrigating hay; on grain we had two or three. The meadows were irrigated by flooding. The water formed a waste lake at northwest part of ranch. Don't know whether lake formed before ditch was built or afterwards, but water wasted into it each year. Always water there since I knew the lake. It covers more than 300 acres, and has no outlet. It is located a little to the west of end of ditch. Is used as a wasteway for the ditch, a natural course runs down into lake. Water flowing from meadows naturally runs into lake. Some knolls next the river not irrigated.

Should judge meadow does not extend quite a mile from ditch. The farthest lateral did not extend quite a mile away from ditch.

Don't think meadow extended over a mile in the furthest place from main ditch. Hay was cut on a strip about two and a half miles long.

We tried oats about four seasons, sometimes more, sometimes less.

The first year we got a snow storm just before harvest and didn't succeed very well. The second year we got about 3,000 or 3,200 bushels; had about 85 acres. The third year didn't have much. The fourth year we didn't seed at all, just volunteer oats which we cut with a mower. Don't think we raised any more oats after that.

Alfalfa mentioned was on south side of grain, north of buildings. The grain was three miles north of the house. We had about 40 or 50 acres of alfalfa. It got thinner every year, and was losing out, didn't have a good stand. It cut about 75 or 80 tons both cuttings. We got two cuttings.

In all these years, outside of these crops of oats and alfalfa, the ranch was used for native hay. That is its best use. We could have cut some more, had greasewood and sagebrush been removed from places. They added a little more each year. Boughton ditch is a pretty good sized ditch. I understood first dam washed away. It was second dam when I started to work there. We moved ditch up the river about five years ago, because we were bothered by wash outs more or less. Bottom of old ditch was about 14 inches above bottom of river. After head of ditch was moved up stream, did not have any more trouble while I was there. We got water right along.

During haying we worked from 19 to 25 men. We kept six machines in field, on an average, sometimes less and sometimes more, according to the season. It took five weeks to put up the hay if we had good weather. We never had our hay hurt by frost down

there. It is a little lower there than it is here, further away from the hills, and naturally milder.

Place used as livestock ranch during those years. Cattle were run principally on open range during the summer, and in pasture. We had three large pastures, can not say how many thousand acres we had pastures, but it was a big ranch.

1220 Redirect examination.

By Mr. N. E. Corthell:

1220 We used through the Boughton ditch all the water it would carry. We pastured cattle on the meadows in winter from about December until the first of May at the latest. They used to run there about 4500 head of cattle.

Recross-examination.

By Mr. Delph E. Carpenter:

They turned strong cattle onto range in April. This 4500 head included stock cattle and all. They raised them to four years of age before shipping. They started feeding hay to poorer  
1221 cattle about Christmas and after ground was covered so cattle could not get any grass in meadow, they were all fed. The whole ranch was used for wintering of stock.

WILLIAM S. INGHAM, a witness in behalf of the Complainant.

Direct-examination by Mr. N. E. Corthell.

1221 I have lived in Albany County, Wyoming, 26 years. Ranched at the Boughton Ranch from July, 1886, to the winter of 1894.

1222 I assisted in irrigating from the Boughton Ditch. The main ditch was completed when I went there and for the next 8 years we were extending laterals and completing the irrigation system. It was almost but not quite completed while I was there. There were still possibilities of bringing a small amount of additional land under the ditches. I think practically all the land susceptible of irrigation from the ditch has been irrigated. The crops grown while I was there were principally native hay; some years considerable oats, and once some alfalfa.

1223 The alfalfa was in 1889 or 1890. They turned 6,000 cattle on it the year it was put in and this destroyed it. The cattle were Douglas-Willan-Sartoris cattle. The oats grown for several different years were from 100 to 200 acres. The crops of oats were good. When I first went there they cut only about 200 tons per year of native hay but the year I left it had mounted up to about 1300 tons. Before irrigation from the Boughton ditch, that ranch produced native grasses, sage brush and grease wood.

1224 Not more than 50 to 60 acres of the land without irrigation would produce hay.

The irrigated area on that ranch when I left was about the same as now, about 7,000 acres.

1224 Cross-examination by Mr. Delph E. Carpenter:

I think the acreage irrigated under Boughton Ditch would run up to 7,000 acres.

WILLIAM L. AYRES, a witness in behalf of the Complainant.

Direct examination by Mr. N. E. Corthell:

1225 I have been farming since 1895 under the irrigation system of the Wyoming Development Company, near Wheatland. I have 860 acres. There have been years when we were a little short of water. That has also occurred since the completion of the large reservoir on the Laramie Plains known as Reservoir No. 2. There have only been one or two years that the farmers had all the water they wanted. We were short this year.

1226 Last year we got along fairly well, though there were a good many complaints about the water last year. The lands of my neighbors take more water than mine. Some of mine is sub-irrigated. With that exception I use about the same amount of water as they do. They are using it to the best advantage they know how. We usually feel the shortage in the last irrigation of alfalfa, the last of August and first of September.

There have been several years they have had to sectionalize—give one lateral water for three days, and then change to another section for three days.

1227 Cross-examination by Mr. Charles F. Tew.

I have nothing to do with methods of carrying water from Wheatland reservoir to Wheatland land. Water used under system about Wheatland comes almost entirely from Laramie river through the reservoir and the tunnel into Blue Grass and then into Sybille creek. We also have a little supply of water from Sybille Creek. The water is discharged from Wheatland reservoir into Laramie river again, then through tunnel into Blue Grass. A man is stationed at diversion dam in the river most of season to keep it calked. Calking has been required on a number of occasions.

1228 Sometimes condition of dam has affected the flow of water so much that dam had to be calked. I lived near Wheatland. The reservoir is about 40 miles from where I live. A range of mountains lies between me and the reservoir; the same range lies between me and this diversion dam at head of tunnel. I have been at dam quite often; have heard frequently that the dam was leaking. That had nothing to do with our shortage of water, they calked that, as a rule, the first thing in the spring. Laramie river flows along north of Wheatland tract. If dam had been leaking the people in that vicinity would have noticed it.

1229 There are a few ranches on the river below the dam, but most

of water there raises below the dam. Mountains mentioned are known as the Laramie Range. The Cooney Hills lie between me and the mountains. The dam that requires calking is at the upper end of tunnel. It water was not diverted from stream by the  
 1230 dam it would go on down Laramie River to the north. These waters are turned by the dam, when it is in good shape, through a tunnel into Blue Grass Creek, which is on east side of Laramie range. It then passes down Blue Grass Creek. From Blue Grass it is discharged into Sybille, then down Sybille about a mile or more, and is diverted into No. 1 Ditch. Below there is Ditch No.

3. Have made a good many trips up to the tunnel with parties with my auto. Used to make it with a team quite often.  
 1231 I have the only car that has been through there except one. The dam stops the entire flow of the river at times. My car registers 15 miles from the dam in the canon to the reservoir. I never had anything to do with filling reservoir.

We aim to commence irrigation about the first of May, on the hay meadows up above, and continue until water plays out as a rule. The country under the Wyoming Development Company project near Wheatland is a different character of farming from that up in the Laramie Plains. Wheatland has lower elevation and is better fitted for culture of agricultural crops.  
 1232 Along the river above Wheatland, the old places were nearly all hay ranches, but they have been opening up a lot of farming around Laramie City, raising some grain the last two years. We usually raise pretty good crops of wheat, oats, alfalfa, barley, a few potatoes and some beets at Wheatland. New land is broken out each year in that district. I have 860 acres. I farm that  
 1233 myself; have a couple of Mexicans living there now on one place, but otherwise I run it with hired help. Have several houses on the property. All of this land is broken. I have 860 acres of deeded land of my own, and my brother has 100 acres in with me. I have had 500 acres in alfalfa last 4 or 5 years, but have  
 1234 been breaking up some old alfalfa and reseeding. Have about 160 acres that has been in alfalfa 8 or 9 years. The

Wheatland tract is becoming more devoted to the culture of alfalfa but a few years ago it was nearly all grain. In irrigating we have to flood all our ground except what sub-irrigates. Sometimes there is ample water and not distributing capacity in the ditches to meet the desires of all who want to irrigate at the same time. If they had sufficient capacity to give all all they want they would have the water in the reservoir down in 30 days.  
 1235 Shortage of water is the usual complaint in every irrigating country. My country no exception to the rule. Some of our farmers needed more water in 1913. Part of them got three cuttings of alfalfa, and part but two. Some lands that take more water than others. You can use too much water on certain lands. There are some such lands within Wheatland territory. The grain  
 1236 crop in Wheatland district 1913 not as good as in some other years, due to hot weather we had, but we did not have water to give it, as we should have given it, in the hot weather.

The cause of shortage depends somewhat on land. It depends on many circumstances. Weather conditions and so on, and all sorts of theories are advanced for these shortages. The same is true in our country as in any other. It takes two good waterings to make a grain crop in our community. Some do not go over their crops a second time, and some water three times. Most of our grain is of the spring variety. We generally commence irrigating grain about June 1 to June 15, it varies, sometimes we don't get

our grain sown until the first of June. June and July is  
1237 when we give it the two irrigations. The average farmer usually finishes the first irrigation of grain in June; the second irrigation in July; although at times we irrigate grain

1238 after the first of August. The heavy flow of water in Laramie river and Sybille creek begins about May 20. Before we

had any reservoirs we figured our river water that had to do all our irrigating between May 20 and July 1, because the water fell after first of July. During this period there was a considerable flow in the stream. The heavy flow of water in the Laramie and the Sybille varies somewhere between May 1 and July 10.

Winter grain is irrigated earlier than spring grain. Outside of spring grains, I think alfalfa occupies the greatest area. It is pretty nearly half and half, I should judge. The grain and alfalfa constitute the greatest portion of the irrigated area. About as many acres devoted to the culture of sugar beets this year as last. Last year less than preceding year. In 1910 they put in more beets, but were discouraged because of shortage of water.

1239 I think they estimate about 30,000 acres of tilled land under the Wheatland project. In 1912 we had more water

1240 than in 1913. Every user got water all summer. In 1913 the users got water, but not all the time. Many users didn't get water for the third crop of alfalfa. In 1911 the water was short and a number of farmers did not irrigate in the fall. There was plenty of water in 1909. The grain was pretty fair in 1911. Most of the irrigators got over their grain twice. We irrigated

1241 it practically continuously from somewhere in the middle of May to the first of July, but there was lots of it needed water later. They were probably irrigating hay between the two waterings of grain. We get water started in the ditch from May 1 to May 10, as a rule, and continue until we haven't any more water. However, they shut the water down at times and hold it for beets and potatoes. If they have the water, they continue to run it straight through the season. I think the ditch was shut down for two

1242 weeks the first of September, 1913. The ditch was running pretty well in 1913, until that date. That covers the irrigation season rather well, but there were some who didn't get through. In 1912 they did not shut the water down entirely, but they shut us off for grain and allowed it for beets and potatoes. I think there was water running in the ditches all the time. I think they were short of water in September, 1911. Part of

1243 my land does not require much water, and I am not half as particular about my water as others are. A lot of my land



is sub-irrigated from seepage. I suppose the seepage comes from the ditch. There are a few patches in the area that don't use much water, but the majority of them use all the water they can get, and call for more, late in the fall. In June and July they have about all they can take care of, I believe. Everybody has plenty. They irrigate wheat, oats and alfalfa. That is the time we are doing our heaviest irrigation. During the time we are irrigating the grain of all kinds and the alfalfa we have plenty of water. The calls  
 1244 for more water come late in the season. We have lots of late grains needing late water.

The delivery of water from the reservoir is under the supervision of the manager, and under him are certain superintendents, or ditch riders. If water is short they have to shut it off and hold it until they need it the worst. In 1910 there was ample water for  
 1245 the crops from May until July 1. There were complaints in August. In 1909 we had all the water we needed and some left over in the reservoir. In that year the ditch ran full all summer and a considerable quantity of water passed down the river north of Laramie; for over six weeks the water ran down the river in very large quantities.

1246 In 1909 I was at the diversion dam at the upper end of the tunnel. They took the boards out of the spillway and water ran down the river. There was a big head of water going down for a month anyway. The reservoir was full that year and we didn't empty it. The water ran over the spillway of the reservoir, while the gates of the reservoir were wide open. I should judge that condition continued for three or four weeks. I think we had a little better crop that year than since. There may be a little more acreage in crop the last two years than before. Don't know that there are  
 1247 any larger yields. I think other years were about as good in crop production as 1909. It seems to me there was one other year when water went over the dam that we didn't use, but could not say what year that was. There could not have been more than two years in which we had the reservoir full. I  
 1248 think the dam in the river will divert nearly all the water in the river going through the gates of the reservoir. I have not been in charge of the reservoir or those gates. Outside of the  
 1249 years 1907 and 1909 I don't think there has been a year but there has been some complaint of shortage. Some farmers cut alfalfa only twice, some of mine is cut three times. During this time I have been continuously irrigating and growing a very similar acreage of wheat and grain. The crops have turned out a good deal better some years than others, like any farming country. We have had very good crops there right along, of course I will tell you the better farming they do the better crops they get.

Cross-examination by Mr. Fred Farrar:

I own this 860 acres. There is 640 acres I think that all joins at the corners. It is six miles south of Wheatland. I have 80 acres four miles northwest of my home place. The 200 acres that my brother and I own together is a mile and a half east.

Fall grain is generally ready to cut in the Wheatland area about July 15 to August 1. We very seldom commence cutting fall grain before July 15; spring grain runs from August 1 to October 1, usually ready for cutting about August 10 to September 10. Many persons in the Wheatland tract secure only two cuttings of alfalfa. There are more who get only two crops than there are who get three. I have been familiar with the irrigation there since the farmers first started. On most of the land there I don't see but what it takes just about as much water now as it did at first. Of course, there is some of the land that lays through the valley that does not take so much water. It depends on what the sub-soil is. On an average through the original Wheatland tract I don't think it takes as much water to irrigate the land now as it did in the earlier years. My lands on the original Wheatland tract were formerly owned by The Wyoming Development Company. My source of supply is mainly the Laramie River, supplemented by storage water in Wheatland Reservoir No. 2. I don't get any water out of Reservoir No. 1. The lands generally get water from No. 1 also.

To the south of the original Wheatland tract there is a second tract known as the Bordeaux tract, consisting of about 10,000 or 13,000 acres. In a northwesterly direction there is another tract known as the Sybille or Cooney Hill tract. I think they claim something like 15,000 acres in there. At any rate it is quite a large tract. I know there is a small amount irrigated under the Bordeaux tract and none under the Cooney Hill tract. These two tracts in their entirety are to be irrigated from this same system of irrigation which is used for the original tract. They are running water through the Bordeaux tract. I don't think they have run any water through the Cooney Hill tract. As far as I know, all of the acreage in the Sybille tract if it be 30,000 acres and the acreage in the Bordeaux tract, if it be 10,000 acres or more, will be added to the number of acres of irrigated land under this system of reservoirs and ditches. As a matter of fact there is no other place from which they can get the water.

I have from 200 to 300 acres of land that is sub-irrigated. By sub-irrigation I mean that the land is saturated with water from some other source than by the direct application of water to it, it is wetter now than it is in the summer time. In other words, the water has seeped through the land. It is land that lays in a little valley or draw, and the water ditch hits it two miles south of it. The seeped area does not seem to be increasing. I don't consider it a favorable condition to have my land seeping that way.

Cross-examination by Mr. Delph E. Carpenter:

I testified that there was a shortage of water in 1910, '11, '12 and '13, caused from the fact that we did not have our reservoirs full to start with. I was up there in 1910, '11, and '12. I did not know that in 1910, 10,000 acre feet of water out of the river was put into James Lake. I did not know that in 1911 about 10,000 acre feet,

in 1912, 22,000 acre feet, and in 1913, 21,000 acre feet was put into Lake James. All I know is about the water in our reservoir. The water didn't come down to our reservoir. Lake

James is a brand new project compared with our reservoir. I was up to see Lake Hattie in 1911. I don't think

I would be surprised if I knew that their engineer testified that they were running water into that reservoir in 1911. I know that to be a fact. I wasn't up there in 1912. If they took 21,000 acre feet and put it into James Lake in 1913 and about 30,000 acre feet and put it into Lake Hattie in 1913, it probably had an effect on us. A mere 50,000 acre feet of water out of the river might affect us a little. I did not know that they were running water out of Lake Hattie and irrigating raw sod and wasting a large ditch full into Big Basin, a hollow without an outlet, right during September 1913, when I claimed they were short at Wheatland. If that was the fact it is not surprising that we were short down below. Our water shortage might arise from a number of sources that I personally never considered. The only thing I know of was that our reservoir was not full to start with in the spring and never did fill. I understand the reservoir was within six or eight feet of being full when we started to irrigate in 1913. I don't know only from what I heard from good authority. It looks funny to me, if it was full, that we didn't have more water than we did have this year. There has been no water went down the Laramie River this year below the dam.

W. A. BAKER, a witness in behalf of the Complainant.

Direct examination by Mr. John D. Clark:

1258 I have been farming under the irrigation system of Wyoming Development Company, near Wheatland, for 10 years. At first farmed 80 acres, later added another 80.

There has not at all times been sufficient water. I do not remember the details except in the last two or three years.

In these years in the first part of the irrigation season we had a pretty fair run until the latter part of July, then we began to fall short and cut down and sometimes we would be stopped for a few days. That is the experience of my neighbors also who are under the same ditch—Canal No. 1.

There are always some careless people who waste some water, but as a rule there is very little waste. The road supervisor has been looking after it pretty close, telling the farmers to keep the water out of the roads.

There was not sufficient water this year at the end of the run. There had been no waste of water the early part of the season that

I know of. I live  $5\frac{1}{2}$  miles from Wheatland. I am familiar with the south one-third of the Development Company lands.

In that district there has been very little waste.

There was a shortage of water this year and last year.

## 1260 Cross-examination by Mr. Delph E. Carpenter:

The shortage of the last two or three years has occurred the latter part of the season. Some farmers order their water shut off. The canal company are readjusting the delivery of water to the various consumers during the period. I presume oats, beets and potatoes would be termed a late crop.

1261 Some oats are planted in June; not ripe until the latter part of September. The principal late crop is beets. Some irrigate beets before August 1st, usually the first irrigation the latter part of July. Oats are the latest crop; spring wheat a little earlier. I have had some late oats caught with frost. We

1262 irrigate these late oats until September. Oat harvest usually commenced the latter part of August. In the latter part of July irrigation of oats mostly completed. My farming has been devoted almost entirely to grain and hay. I think people in my neighborhood are careful in providing labor for the distribution of water.

## 1263 Cross-examination by Mr. Fred Farrar:

I never read my contract with the company. I don't know just what the wording is. I have understood that I get my appropriate share of what water comes down. I don't think it is prob-

1264 able that I have used most of my water supply early in the season and so am short at the latter part, because I don't get any more in my ditch than my neighbors do in theirs. I was short in the latter part of the season of 1912. I did not make any demand on the company for water. I just simply found out what was the matter. They said there wasn't anything in the reservoir. I did not know that as a matter of fact they carried over 40,000 acre feet in reservoir No. 2 at the close of the season of 1912. I was not up there. I know Mr. J. A. Elliott, the surveyor and manager of the ditch this year. He should have more definite information about these things than I do. That would be his duty if I understand his position. Assuming it to be true that in 1912

1265 they carried over 40,000 acre feet of water in that reservoir, any lack of water which I had in 1912 was not due to failure of supply. If Mr. Elliott testified that the river stayed up all season in 1912 until fall, I should not question his statement.

J. A. WHITING, a witness in behalf of the Complainant.

## Direct examination by Mr. John D. Clark:

1266 I am a civil engineer and reside at Cheyenne, Wyoming. I made an examination of ditches diverting water from the Big Laramie and its tributaries in Colorado during the spring of 1910, from April 28th to May 7th.

There were six in the party. I was in charge.

Mr. Decker, the water commissioner over there, took me up the Big Laramie and showed me these ditches except one or two, the location of which he described and I made a note of this location in

a book. I found all but one. This one I could not find though I searched assiduously.

1267 The ditches from the Laramie River in Colorado use the flooding method, that is, they merely divert the water from the stream and let it flood the meadows. I saw only one or two laterals. The distance from the ditch to the river was, in most places, so short that no lateral was needed. The land irrigated was river bottom, generally extending 500 to 600 feet from the stream. Some of the ditches get back approximately 1200 feet from the stream. The land was used mostly for native hay. Some of the ditches were in sage brush, some in timber, and some was irrigated for pasture.

1268 None was cultivated for crops outside of a garden or two.

In some places the water was diverted by piling rocks in the stream, in some places bushes were used and in some places the fall of the stream was sufficient to force the water into the ditch without any dam.

In some places we found wooden head-gates and in some places no head-gates at all. We surveyed the total acreage under the ditches, and made two classes, first, that on which hay was cut, and, second, that in willows which had been irrigated for pasture.

1270 The total acreage of meadow was 1287.52 acres, and 567.6 willows, making a grand total of 1856.64 acres.

That included the entire acreage lying between the ditch and the river.

We carried this work up the river about three miles above Glendevey.

We took into consideration the tributaries, Stuck Creek, Link Creek, McIntyre Creek and one other Creek whose name I forget. Think Glendevey is about 20 miles above the state line, and about three miles below the diversion tunnel of the Greeley-Poudre Irrigation district.

These ditches were average ranch ditches. There was one of the ditches that gave evidence of having been used at some time but not recently.

1271 That was Long Park Ditch No. 2.

#### Cross-examination by Mr. Delph E. Carpenter:

I found a mountain valley above the Colorado-Wyoming line. Up around Long Park Ditch No. 2 and above Glendevey there are high mountains on both sides with a sort of basin in which the Link ditches are. I remember one of them covering quite a nice meadow, the other one, which was on the West side, covered very little meadow. Then, there was sort of a narrow channel down until you passed Glendevey, or just opposite; below there the mountains were less high, and the valley was probably three-quarters of a mile wide, it varied at different distances. The irrigation consisted of strips of meadow down through this mountainous valley on each side of the stream. I was supposed to survey the land under all the ditch from Long Park down to the state line. I found a frame but no head-gate

in Long Park Ditch No. 2. No gate whatever in Link Ditch  
 1272 No. 2 out of Link creek, so far as I know, the only ditch tak-  
 ing water out of that creek. -I found the Homestead Ditch.  
 As far as I remember that is all. I think I found measuring flumes  
 in all of them. I was advised that those ditches, for many years,  
 had been in charge of the water commissioner. In fact, a former  
 commissioner, Mr. Walter G. Decker, aided us in this matter.

I did not go on the Little Laramie River at that time and investi-  
 gate the diversion dams there. The structures which I have seen  
 on the Little Laramie are those for recent ditches. As far as I know  
 there is only one concrete diversion dam or headgate on the Little  
 Laramie, that of the James Lake project. All of the dams that I  
 know of on the Big Laramie River in Wyoming are timber or plank.  
 Some of those I saw were very well constructed, while not expensive  
 in any way. It is evident from the dams constructed in Colorado  
 that they were able to get the water out into the ditches. Perhaps  
 a little more work would be required after the time I was there. It  
 was in the spring and the water was low. The irrigation by means  
 of these ditches would take place at a time when there was more  
 water in the river. I did not run the instrument in this sur-  
 1274 vey. Mr. Grant and Mr. George Marsh each of them had  
 an instrument. I was out from April 28 to May 7, inclusive.

Cross-examination by Mr. Fred Farrar:

There was no snow in the valley when we went in there. The  
 valley which I have described is the Laramie Valley in Colorado.  
 The trend of the stream is generally north. It flows between two  
 ranges of hills more or less clearly defined all the way from the  
 upper point I visited to the state line and even below that. This  
 valley is narrow, being possibly half a mile in width on an average,  
 and the irrigated land lies right in the bottom of this valley along-  
 side the stream. There is here and there an enlargement which we  
 might call a pocket. Aside from the garden patches the irrigated  
 land was devoted to native hay. The Laramie river has numerous  
 tributaries coming in, some on the east and some on the west  
 1275 side, all the way up and down its course through Colorado.  
 The country is entirely a mountainous country. At the  
 upper end the mountains are extremely high.

Redirect examination by Mr. John D. Clark:

1275 The Laramie Valley at the most southern point reached  
 by me is about one-third of a mile wide.

Recross-examination by Mr. Delph E. Carpenter:

I made no measurements of meadows above that point. I took  
 those ditches I have mentioned from there to the state line.



MORTIMER N. GRANT, a witness in behalf of the Complainant.

Direct examination by Mr. John D. Clark:

1276 I am a civil engineer. In 1913 I was Water Commissioner for that district in Wyoming covering the Big and Little Laramie Rivers and their tributaries from the state line down to a point about a mile below the junction of those two rivers.

On the Big Laramie complaints about water were made that year, the latter part of May or first of June, by the Wyoming Development Company, and complaints were made about July and August by four or five ranchmen. On the Little Laramie more complaints were made, mostly down towards the mouth.

1277 The complaints on the Little Laramie were chiefly in July and August.

I encountered quite a bit of trouble in distributing water among the users from the Little Laramie in 1913 because of the low stage of water in the Little Laramie River. It practically disappeared before it got down to its mouth. I took a vacation and ended my duties that year about Sept. 1st.

1277 Cross-examination by Mr. Fred Farrar:

During the period mentioned, my headquarters were at Laramie. During July and August I was in the field the major portion of the time. My trips generally consisted of the following: I went up to the head of the Little Laramie, down the Big Laramie and back up the Little Laramie. I think I made seven complete round trips, aside from side trips. That is only approximately, I don't know the exact number of trips. The Wyoming Development Company, mentioned, which made complaint, is the Wheatland Company. No complaint was made against Lake James, there was one complaint made against Lake Hattie. I don't remember the exact date, it was about June 8, I imagine. In the year 1912 I think there was a man named Wilson acting as water commissioner on the Little Laramie, I don't know who was on the Big Laramie, I understand there was a commissioner. Previous to that year there had been water commissioners appointed, but they have never been out in the field to amount to anything. The water commissioner, as a rule, only goes out in the field when called. Otherwise he does no actual work.

1279 Cross-examination by Mr. Charles F. Tew:

I was called on to measure water. I usually did all my work with a current meter. I was not making reports for the state engineer's office. The current meter was employed because there were no measuring devices in the Big Laramie ditches that were adequate. The practice prior to 1913 on both the Big and Little Laramie rivers, so far as I know, has been to employ the water flow of the stream without the assistance of a water commissioner on the grounds, also without the assistance of any measuring devices in the ditches. The only time the water commissioner had been employed

on the Big and Little Laramie rivers to my knowledge was when there was complaint by water users. I think that was the practice all over the state. I think in 1912 the water commissioners on the Big Laramie were put on a salary and supposed to be in the field all the time.

1280 There have been differences prior to 1912. In 1912 there was no complaint that I know of. There was a man employed as commissioner but I have forgotten his name. I never heard it mentioned. With the exception of the Pioneer dam on the Big Laramie river and the Lake Hattie Supply No. 2 dam on the Big Laramie river, the dams all up and down the river are what you would ordinarily call ranch ditch or beaver dams, consisting of brush and the like. Each freshet modifies the dams somewhat. There were no set or fixed conditions at the head of any ditch whereby former measurements would be a proper guide as to the inflow into the ditches. It would be impossible for a person on either river in the year 1913, to state without a current meter, or measuring device, what amount of water was being taken into any ditch at any time.

All that could be reached without the use of instruments  
1281 would be a poor approximation. From conditions I saw on the ground, I imagine that those conditions had existed and prevailed always. With the exception of the Bellamy canal diversion and the Lake Hattie No. 2 diversion on the Little Laramie, the remainder of the dams were of brush and the measuring devices lacking the same as on the Big Laramie. The Bellamy ditch is the intake for James Lake. From what I have seen on the Big Laramie, it is as I have described. When I made these trips I generally went to the several headgates. I established rating stations and put in gauges on several of the ditches. I traveled up and down the river with a team and went up as far as Wright's and stayed there and then went around the country and crossed over to Lake Hattie and Sodergreen's. I measured pretty near all of the ditches from time to time. I put in staff gauges to see what was flowing in. On the Little Laramie River there were quite a number of complaints made in July and August. Rating stations were placed in only the biggest ditches. There were no particular clashes that I had any trouble

over. I either shut them down a little bit or opened them  
1282 up accordingly. There were some cases where there were no headgates. The only place I had any trouble was on the Big Laramie, and there I sometimes shut down the gate or throw manure in it, probably old gates were in, but they would leak.

Most of the ditches on the Big Laramie River are what you might call two-story ditches; that is they were above the bottom of the creek so they would have to have a dam to divert at low stages. At high water they got all the water they needed. They start to drawing water for these meadows in the higher stages in June. The whole territory along both streams is used as a hay ranch

1283 country. The irrigation season is close onto ten weeks for hay. They generally use their water right up to the time they cut their hay, which is about the middle of July. Some may start in later than the first of May to irrigate, but they generally irri-

gate from the first part of May to the middle of July. There was clamor of shortage of water but they gave us no trouble; the flow could be regulated by using manure as described. The Big Laramie River got down pretty low in the latter part of July and August, with a manure and rock dam you could divert all the water.

There were a number of what I called two-story ditches. The average ditch does not cut the bottom of the river. A great many of the ditches are two-story. With a two-story ditch the irrigator obtains all the water he wants when the river is high, but at low stages it requires a dam. At such times the user goes to the head and throws some obstruction in the stream to suit his desires. The change of elevation of water of course makes a change of intake capacity in these two-story ditches. The irrigators settled their questions themselves; they probably would be disgruntled, but didn't bring complaints to my office. From the conditions I noted there on the channel of the river, it looked to me that the same conditions prevailed as they had in the past. It is also true that each high water flow modifies these dams to some extent, washes them out and they have to be re-installed. While the dams have been changed from time to time, the ditches have remained unchanged.

1285 Cross-examination by Mr. Delph E. Carpenter.

Lake Hattie evidently had been receiving water after the ice had passed out of the river in the spring. I cannot tell you the amount water in Lake Hattie, I haven't the data with me. They had diverted only from the Big Laramie River in 1913 but I did not keep a record of the flow. I read the gauge every time I was there. They ceased running water into Lake Hattie on about June 8, 1913, and I think that Lake Hattie was about half full in addition to all the dead water space in the lake. I would say that they had approximately 20,000 to 30,000 acre feet of water available for irrigation

1286 in Lake Hattie.

I did not know that they were running water out of Lake Hattie and wasting it into Big Basin until about the first of September. The only time I knew of their running water down into Alkali Lake or Alkali Basin was when they tried out the canal once or twice. It only ran for a day or so at that time. I heard that at a later time when Mr. Goldsborough had some prospective land buyers out there he ran water for several days and wasted it into Big Basin. I did not go to look it up. I think there was considerable water left in Lake Hattie when I resigned, about September 15. My active duties as water commissioner ceased September 1st, after that date I was only subject to call.

Water was diverted through a ditch known as Sodergreen's high line ditch in the summer of 1913. That is a recent ditch; a recent appropriation. The Sodergreen high line was shut off in June some time with the exception of one or two day's run.

1287 I cannot say how much water was diverted into Lake James during the summer of 1913. I kept no record.

I had the record of flow and gauge height of Lake Hattie from Mr. Meeker; the only gauge heights I took from time to time were those I had to take when I was there to check his.

The first complaint I received was from the Wyoming Development Company, directed against Lake Hattie enterprise. There was, I imagine, about a week, I didn't get any records on the steel bridge at Lookout. I think Mr. Elliott went up and measured the water at the steel bridge and made complaint at that time. His complaint was that there was insufficient amount of water coming down to the

Wheatland reservoir to satisfy their rights. I turned the 1288 water down from the Lake Hattie diversion because Lake Hattie was what was called a flood water right to fill Lake Hattie, and Wheatland was prior to Lake Hattie. In other words, the Lake Hattie enterprise was a very recent one, more recent than the one below.

On both the Big and the Little Laramie rivers it is practically physically impossible for any water commissioner to properly apportion the waters with the appliances that exist at the present time. The Little Laramie is better as to headgates than the Big Laramie. Everything is so crude on both rivers that an apportionment according to the legal rights of the parties is practically out of the question, unless one has a current meter to measure it, and then it is a matter of a good deal of labor to try to regulate the water. Each rating consumes considerable time and expense. So that, for the orderly administration of that water supply the conditions are not 1289 there. The accuracy of the ratings depends on the percentage of errors you expect to allow. You can't get them down to any fraction of a foot or so, on any of those ditches, without cleaning out the channel, but it is almost as good as a measuring flume ordinarily. The Big Laramie is passing through the same history that all streams have passed through until a certain pressure is brought to bear on them, when they have to put in certain devices to regulate the water.

The James Lake enterprise is a comparatively recent one.

JOHN CHAPLIN, a witness in behalf of the Complainant.

Direct examination by Mr. John D. Clark:

1290 I have been secretary and treasurer for Wyoming Development Company for about 30 years.

Prior to October, 1885, the company expended on its Canal No. 1, \$142,210.94; from 1885 to 1902, it expended \$1,390.82.

1291 Up to October 1885 the Company expended on Canal No. 2, \$33,023.46. Subsequent to October 1885 and up to 1902, it expended \$1,795.65.

Before May, 1886, the Company expended on the tunnel \$138,311.66. The first expenditure shown in the books was in 1883. The Company expended on the construction of the diversion dam in April and May, 1885, \$1,835.27. Expended in constructing laterals in 1885, \$4,178.42. The expenditures in construction of No. 3 Canal and No. 1 reservoir were as follows:

In 1894.....	\$14,442.55
In 1895.....	18,884.18
In 1896.....	779.20
In 1897.....	8,067.59
In 1898.....	2,181.76

1292 Subsequent to 1898, \$907.

The expenditures in constructing Reservoir No. 2 were as follows:

In 1894.....	\$47.70
In 1895.....	225.85
In 1898.....	77.30
In 1899.....	7,992.70
In 1900.....	55,886.63
In 1901 to July.....	49,330.59
Subsequent expenditure, \$1,980.79.	

The general expenditures by the Company not included in the above from 1882 to 1901 were \$156,075.17. This does not include advertising and commissions for land sales agents.

1292 Cross-examination by Mr. Delph E. Carpenter:

According to my recollection those figures are inclusive to January 1, 1902. The \$47.70 for 1894 expenditures was for preliminary work. There was some investigation being made and that was the expenses. I think probably they were Mr. J. A. Johnston's traveling expenses. I cannot explain what items went to make up these \$225.65 for 1895; probably some surveying. In 1896 and 1897 there was nothing charged against the reservoirs. I do not remember for what the \$77.30 was expended in 1898; I suppose some investigation. I presume the figures for 1899 of \$7,992.70 were for construction.

JOHN MCGILL, a witness in behalf of the Complainant.

Direct examination by Mr. John D. Clark:

1294 I own lands in Albany County about 40 miles north of Laramie, which have been irrigated since 1882. We have one main ditch, the construction of which began in 1879. We got water through in 1882. We have irrigated 705 acres every year since 1882.

1295 The land is in Townships 22, Ranges 73 and 74. The ditch is the McGill Ditch.

1295 Cross-examination by Mr. Delph E. Carpenter:

I irrigated land devoted mostly to native hay, some little oats, a narrow strip on the west side of the river. We originally had our own dam, but when built the dam of reservoir No. 2 Wyoming Development Company submerged our dam and we now use their

dam for diversion. We turn the water off the meadows to go to haying about July 15. We begin irrigating in the spring along about May 20. Our ditches are so constructed that the snow piles into them, and very seldom they are opened before May 20, before the ice is all out.

The lands belonging to me and those belonging to Mr. and Mrs. Dodge are the only irrigated lands between the dam of Wheatland Reservoir No. 2 and the canon of the Laramie River through the Laramie mountains. This 705 acres I speak of is all part  
1296 of my ranch. We usually cut hay over the whole 705 acres, sometimes it is a little light and we don't cut it, but let the cattle eat it. I should think we average between 600 and 700 tons of hay per year over the whole area, but I have never weighed or measured it. I feed the hay to my own stock. I handle cattle, sheep, and a few horses. We own something over 5,000 acres of land. There is 2,368 acres of that land we call the Home Ranch in one body, all fenced, of which 705 acres are irrigated. The remainder of the 5,000 acres is scattered and is used mostly for grazing. We get some little hay off of some of it. We now have about 4,500 sheep; our average holdings would probably be 6,500 or  
1297 7,000. We have 850 head of cattle, a little more than our average holdings. We have from 90 to 100 head of horses, including work animals, brood mares, colts and all.

In the summer time we turn our stock loose on the range, we find some of them clear over in Carbon county. The range is open and unfenced through a large area west of us. We turn the cattle loose about the 10th or 20th of May of each year, and try to get them all in each winter. We usually get them gathered about October 15. We have herders with the sheep all the time and keep them out at our camps over the range, winter and summer. We keep our work horses in the pasture during the summer;  
1298 the brood mares and colts run out.

We have from 30 to 60 acres plowed, for about 25 years. We raise oats for our own use at the ranch, sometimes we cut them and don't let them get ripe, cut them just for hay. I find that we obtain the best returns one year after another from the land which is irrigated to native hay. I planted alfalfa, but it kept killing out. Our land is too low, the next bench a little higher up would be better for alfalfa. We estimate that we have about 1200 bushels of oats now to thresh, we have threshed as high as 1500 bushels. We must have at least 50, probably 60 acres this year. I think that is the highest we have ever had. Other than the crops mentioned, we have always raised a garden and some potatoes just for  
1299 our own use. We have the post office at our ranch. My family and I and one man and his wife live there. The nearest ranch to us up the river is that of the Swan Land and Cattle Company, at what we call the shearing pens, about nine miles from us. They do not irrigate any land there. The next ranch up the valley from the shearing pens is Gillespie's place, at Lake Ione; the first irrigation up the valley from my place. It is about 12 miles from us. The Swan Land and Cattle Company is some-



times called the Two-Bar outfit. They range sheep in the vicinity of my ranch and between it and the Gillespie ranch. Outside of the family at the ranch and the family that are taking care of the reservoir, I don't think anybody gets mail at the McGill post office. The rest is sent out in little sacks, and left at the mail boxes. The first ranch down stream from the Dodge place is the Cramer place, at the lower end of the cañon. I own it now. From there on irrigation prevails more or less in strips of land along the valley to Fort Laramie. Between the Cramer place and the Dodge place, probably 25 miles, there is not irrigation. Dodge Creek and Duck Creek empty into the river between these two ranches. The Dry Laramie comes in below that. Dodge Creek and Duck Creek drain country to the northwest of the river.

1301 I am State Tax Commissioner for the State of Wyoming at the present time. I am the entire commission.

Below my ranch about 4 miles there is a very large spring called Big Springs. Didge creek is fed a good deal from springs and Duck Creek partly. There are springs over on the Blue Grass, but they empty into the Sybille. There are the Sybille springs further south. The range of mountains that runs from Laramie City down on the east side are called the Black Hills ranch. The Laramie mountains, as we understand, are the mountains around Laramie Peak north of us. It is all practically one range. Sybille Creek rises pretty well on the west of the Black Hills, flows northeast through the mountains and discharges its waters into the Laramie River on the west side of this range. Blue Grass creek is a tributary of the Sybille.

My place is pretty close to 7,000 feet in elevation. The Cramer ranch, on the east side of the Black Hills, is very much lower.

1303 Cross-examination by Mr. Charles F. Tew:

There is a range of mountains extending from Laramie Peak southeasterly which we commonly call the Laramie mountains, cut through by the Laramie River cañon. The river has a big fall. In this 25 miles of cañon through which it flows I think it falls 2,000 feet or more. The country around Wheatland, which, generally speaking, is at the lower end of this fall, is some 2,000 feet, or more, below the level of the country where I live. Wheatland is 2,000 or 2,400 feet lower than the general level of what is known as the Laramie Plains, in which my ranch is situated. They are raising some alfalfa on the Laramie Plains, but in a general way they engage in raising stock and hay and some alfalfa and oats

1304 on the Laramie Plains. They have longer growing seasons down in the Wheatland country than on the Laramie Plains.

There is no question that the season for the growing of crops is considerably longer about Wheatland than it is on the Laramie Plains; Spring is earlier in the Wheatland region and the frost does not come so early as it does with us. A hay ranch country is all we have used the Laramie Plains for. That is what it is naturally adapted to. The Wheatland country is more adapted to farming. Experience has shown about Wheatland that they do and can raise

crops by what we commonly call farming methods. Thus far experience has shown on the Laramie Plains in about 30 years of effort and trial, that they are fitted for this other purpose of raising hay and oats and some alfalfa and the grazing of stock. During all the time that I have been engaged in the business I have only tried to raise stuff enough to winter our stock. I recognized that was the fitting business for the place. We shut off irrigation of our native hay July 15th and sometimes irrigate our oats after that. Our place, at an elevation of about 7,000 feet, is about the lowest place where hay ranching is done in what is known as the Laramie Plains. We are at the lower end of the plains. These plains are separated from the plains which lie to the east of them by a chain or rim of hills, which are known in the northern extremity as the Laramie Mountains, through which the Laramie River breaks, and then have a name south of the Laramie river of "Black Hills," which rim extends down to about Sherman Hill, so-called, where the Union Pacific crosses. This rim is the eastern boundary of the Laramie Plains. The point where the railroad crosses is the highest point on the line of the Union Pacific. Southwest of that the rim extends on and runs into a range of mountains which is called Boulder Ridge, which is in Colorado on the southerly side of the Laramie Plains. The Boulder Ridge extends into the Green Mountains, that is, the extreme southern boundary of the Laramie Plains. Under these several names there is a continuous rim or east boundary, of the high territory or hay country, called the Laramie Plains, extending from Laramie Peak to the east and south. Fish Creek heads in the southern rim of the Plains and runs south into the Cache la Poudre. It drains a very little portion of the land.

1308 I had a dam across the river at the head of my ditch prior to the construction of the dam of Wheatland Reservoir No. 2. When they built their dam, it left our headgate and intake point on the Laramie River above the embankment which they placed across the stream. Consequently it was necessary for the operation of my ditch to have an outlet tube through this embankment. This has been maintained there since. I have always had plenty of water to take as soon as the snow went out of our ditch. There has never been any lack of water. Nobody ever objected to our taking what we wanted. Sometimes I opened the gate at the reservoir and sometimes they did. Ever since the reservoir was built I have always found plenty of water there. There was one year the reservoir was pretty low. They wanted water below and they shut my ditches and we had trouble about it. I wanted some water for my stock. That was nothing serious, but water was pretty scarce. My ditch is 5 or 6 miles long; 10 or 12 feet wide on top and 3 feet deep, without much fall. Water passing through my ditch and unused flows back into the Laramie River.

1310 All the seepage goes back. One year they used my ditch for the wasting of water from the reservoir. There was a tremendous head of water came down and they had all their ditches

open and we opened ours and used it as a spillway. At the time of this flood they employed our ditch and outlet tubes to waste water from the reservoir; the water was also running over the wasteway, which is several miles to the north and about the northerly extremity of the reservoir. I saw the quantity that was flowing there. It was a very large amount. It began to cut through and made quite a gorge there and they were afraid it would cut away the whole thing. Then they began to discharge a large quantity through these gates. I would not attempt to say what quantity was flowing through. They employed every method to relieve the reservoir for some time.

I think the reservoir had been practically empty the year preceding. The supply that particular year was enough to fill the entire reservoir and in addition, there was probably more than enough to fill it again. I live about 10 or 15 miles from the place where the Wheatland people take the water from the Laramie River through the tunnel. Water at that point passes two ways, sometimes down the river and sometimes through the tunnel. I have seen it sometimes when there was very little water passing; other times I have seen very large amounts passing; several hundred feet. We have had some trouble, I own the Cramer place below it, and when the water is taken out through the tunnel we get no seepage, and the result is we are short of water and we have had trouble with them about getting enough water down. We generally have enough water from Duck Creek, which comes in below the Wheatland diversion dam. On these occasions when I saw considerable water passing the diversion dam, it flowed over. Formerly the Wheatland people had a dam higher up, and now they have placed it lower down and I think it is more water tight. Formerly the dam leaked a good quantity.

During the thirty years I have never had any trouble with any of my neighbors about my water supply. The water commissioner has never been there once to my knowledge, during the thirty years. I do not have any device in my ditch or in my tube out of the reservoir to determine the cubic feet of water per second that I take any time. There is no need for any, so far as I am concerned. There is no need for the water commissioner coming there so long as there are no disputes. The water commissioner was out at the Cramer place once and shut down our ditches and I objected to it, because later ditches were not shut down. There is no inflow to the Laramie River from the right hand or east side between the Dodge and the Cramer places, but, as I have said before, there is Dodge Creek and Duck Creek on the west side. Outside of two years, there has been sufficient inflow from the river down there through the cañon, so that the people down below the cañon have not bothered me. On these two years that I mention I had trouble at the Cramer place. I obtained the water for the first crop, but not as much as I really wanted. All along the river below the Cramer place there is a narrow strip of valley, north of what we call the Wheatland country and below the mouth of the cañon, irrigated to native hay

along the bottom. They always have an ample supply of water for their crops below the Sybille because they get all the leakage.

1315 Cross-examination by Mr. Fred Farrar:

There is considerable return seepage water from irrigation of land in the Wheatland district below the mouth of the Sybille Creek. There is a distinct chain of mountains to the east of the Laramie Plains which is about 1,000 feet higher than the Plains at Sherman station.

Redirect examination by Mr. John D. Clark:

1315 Dodge Creek and Big Springs furnish the only contributions to the Laramie River between Wyoming Development Company Reservoir No. 2 and the diversion tunnel. Dodge Creek is from melting snow and drains in April, May and June. After that the flow is very light. You can't step across it when it is high.

1316 You can after it is low. Big Springs gives a steady flow. You can step across that. My testimony as to flowing over the dam has reference to the old dam which was changed several years ago.

1316 Recross-examination by Mr. Delph E. Carpenter:

Duck Creek is quite a good sized stream when flowing water from melting snow. You can't step over it. The same is true of Dodge Creek, but it does not have such a large volume of water as Duck Creek. Duck Creek has probably three times as much water as

1317 Dodge Creek. Dodge Creek flows a pretty heavy head of water from about the middle of April to probably the middle of June. The water runs very rapidly, it has an awful fall. When it is high it carries more than big ditch full of water. Sometimes it comes up and flows strong all the way during the summer months, when there are cloud-bursts or rains. The same is true of Duck Creek, only there is more volume of water there, there is more of a water shed. Even the late summer Dodge Creek is flowing all the time, there are springs there that keep it flowing, but very little.

Redirect examination by Mr. John D. Clark:

1317 Dodge Creek is above the tunnel and Duck Creek below.

1318 Duck Creek does not have so much water as Blue Grass Creek and considerably less than the Sybille.

Certified copy adjudication of the Little Laramie by the Board of Control offered in evidence, Exhibit H.

(Objections to introduction of Exhibit H.)

By Mr. Clark: We will offer in evidence a certified copy of the decree of the Board of Control of the State of Wyoming entered May 5th 1892 in the matter of the adjudication of priorities of appropriation from the Little Laramie River.

By Mr. Farrar: Your Board of Control is a board having quasi-judicial powers relative to awarding or adjudicating priority of right for the use of water, is it not?

By Mr. Clark: That is correct.

By Mr. Farrar: And from the decision or findings of the Board of Control appeals lie to your nisi prius courts and thence to your court of last resort in this state?

By Mr. Clark: That is correct.

By Mr. Farrar: Has any appeal been taken from the findings or awards made by the Board of Control in the matter covered by the decree which you offer in evidence?

By Mr. Clark: No, there has been none.

By Mr. Farrar: Under your law has the time elapsed within which an appeal could be taken?

By Mr. Clark: Yes, sir. This is the Little Laramie.

By Mr. Farrar: On behalf of the State of Colorado I desire to object to the introduction of the certified copy of the decree of the Board of Control with respect to appropriations on the Little Laramie for the reasons:

First, that the State of Colorado, one of the respondents herein, was not either directly or indirectly a party to the proceedings under which said decree was granted and had no opportunity nor privilege of becoming or being a party to such proceedings; neither did it have any notice that such proceedings were being had.

Second, that so far as this cause is concerned, any record or proceeding or any finding or decree made by the Board of Control is ex parte and in no wise binding upon the State of Colorado, and the State of Colorado is in no wise governed or controlled thereby.

Third, that the decree of the Board of Control, a certified copy of which is offered in evidence, is incompetent and improper as evidence in this cause and irrelevant to the issue herein.

By Mr. Carpenter: Let the Record show that counsel for the defendants, Greeley-Poudre Irrigation District, and the Laramie-Poudre Irrigation & Reservoirs Company, concur in the objections already offered by counsel for the State of Colorado and join in said objections.

The copy of the decree was marked Exhibit "H" and is attached to this report.

CLYDE A. DUNIWAY, a witness in behalf of the Complainant.

Direct examination by Mr. N. E. Corthell:

1320 I am President of the University of Wyoming, all of whose departments, College of Liberal Arts, of Agriculture, of Engineering, etc., are at Laramie. The investment in grounds, buildings and apparatus of a permanent character is about one million dollars, exclusive of the value of land holdings derived from federal land grants, and of funds realized from the sale of such lands.

1321 The university campus has 54 acres, and the experimental farm and stock farms just across the river 1,154 acres.

At the experimental farms we expend about \$40,000.00 per year,—

\$30,000.00 from the Hatch and Adams fund, and \$10,000.00 from other sources. We experiment as to stock breeding, as to production of wool, milk, butter and cream, as to fattening for market, and other things connected with animal husbandry. We grow experimentally a great many crops.

1322 Those crop experiments are carried on largely by means of irrigation.

Our station by the Board of Experiment Stations at Washington is regarded as one of peculiar value because it is the highest experiment station in the United States, and the highest station carrying on extensive and continuous work in the world. We irrigate approximately 200 acres. Our plans include the cultivation of the entire 1,150 acres except 60 to 80 acres.

The entire stock farm and about four-fifths of the agronomy farm lie under the Pioneer Canal. The other farm, 640 acres will be under the Lake Hattie Project.

1323 The upper part of this last farm lies under the North Canal, which is completed. The University has been carrying on these experiments since 1891. The water for our use is all derived from the direct flow of the stream. There may be some of it stored in the Sodergreen Reservoir. We use the water chiefly in July and August, occasionally in June and September. We could not carry on these experiments without a continuous supply of water.

1324 The University also owns about 15,000 acres of Federal land grant lands in the water shed of the Laramie River. Of this about one half is susceptible of irrigation. The income from these lands is devoted to University purposes by the terms of the grant.

1325 Cross-examination by Mr. Fred Farrar.

I have been president of the University and a resident of Laramie since August 1, 1912. I had no connection whatever with the University prior to that time. I had been living for four years in Missoula, Montana, engaged in educational work there with the University of Montana. Before that time, for 11 years I was a professor in Leland Stanford University. I am not director of the experimental station here. Henry G. Night is the director. The 15,000 acres of land I have referred to are the endowment lands of the agricultural college, under Morrill acts of Congress, passed in 1862 and amendments thereto or there may be some of those lands granted to the University as a university, because Congress may grant both to the university as such and to the agricultural college as a department of the University. So I have to make the explanation to be perhaps technically correct. I am not certain whether those are the Morrill grant lands or some other grant. When I speak of Hatch and Adams funds, I refer to two funds created by acts of Congress introduced by members of Congress, Mr. Hatch and Mr. Adams. The Hatch and Adams funds are available for all states conducting experimental work in agricultural and animal hus-



- bandry. Wyoming is not peculiar in relation to those funds.
- 1327 The grants or appropriations under those funds are made directly to the states. I find myself inclined to rather emphasize the fact that this is virtually Federal or National work. It is quite true the appropriations are made to the states in aid of such experimentation. The experiments under these funds are limited to certain lines which are designated by the acts themselves and they are under the supervision of the director of the experiment station at Washington. The agricultural college of this state is a department of the University. It is difficult to give the enrollment of the agricultural college, because of the peculiarity of our organization, and owing to the fact that comparisons are instantaneously made between so-called colleges of agriculture where their organization is very different in different states. The college of agriculture and mechanical arts, which is the official title, showed last year thirty students. I made my preliminary statements because in all separate colleges of agriculture with which I am acquainted, and I have studied them quite well, these institutions, include a great many other departments than strictly agricultural and mechanical arts. There is no clear line of demarcation between students in one department and another with us in our interdependent system of departments, students in the department of agriculture take their work in English in the same class with the students in the college of liberal arts, and then the same thing is true in everything except those things which are strictly agricultural. Our course in the college of agriculture is four years.
- 1328 The total enrollment in the University commencing June 30, 1913, was 329. That included all departments. We have a preparatory school of 49. Those were included in the 329 I gave. Our school of commerce is a business school, but is both elementary and advanced. Those who wish to take the elementary course, such as the subjects of stenography, bookkeeping and typewriting, are classed as the third and four year, preparatory. They must have two years' high school work before getting into this course. On top of that preparatory course there is a two years' course of college grade. The entrance requirements for admission to our school of agriculture are exactly the same as for the college of liberal arts.
- 1329 There are 188 acres of land in our experimental farm now under cultivation. The evidence which I have given in response to the interrogatories by Mr. Corthell was, of necessity, based somewhat on reports and the general experience which the University has had. The historical statements which I made are not strictly within my personal knowledge. I did not know that one of the tracts at least covered by our experimental farm was under irrigation from a ditch which was constructed prior to the Pioneer ditch. It requires  $1\frac{1}{2}$  second feet to the irrigating season for the irrigation of the 80 acres in the lower farm of experiment station; that is the water now used. In the upper farm of 108 acres under cultivation we use approximately  $1\frac{1}{2}$  second feet during the irrigation season. Our requirements for the present cultivation

would be about 3 cubic feet per second of time for both places. Our experiment relative to reclaiming alkali land is of importance, because a great many irrigators have found that a few seasons more or less of successful irrigation has been followed by the alkalifying of the land, rendering it unproductive. I believe that to be, from my general knowledge and study, quite extensive. It occurs in practically every irrigation region throughout the country. There has been some experience along that line in the Laramie Plains, and more particularly when this lower farm was turned over to the University as an experiment farm by the state, a good portion of the lands has been alkali. The experiment station undertook to see if these lands could not be redeemed and the experiment met with striking success. The bulletin on the subject is in considerable demand from those who have been having experience of the same kind elsewhere. I have observed some alkali in this vicinity, but my testimony on that would not be important.

1331 Climatic conditions enter into the consideration of the station on account of the altitude. What is called by the farmers the growing season has a great deal to do with it. Those are the approximate limits between the last killing frost in the spring and the first killing frost in the fall. That season differs from the season that might be covered by any other experiment station on account of our altitude. We have a much shorter growing season than that enjoyed by the average station, because we are so high. I could not give an idea of how much shorter our growing season would be than the season at a lower elevation accurately. I do not remember what the length of our season is. We published this fall a detailed bulletin on that and gave the average date of the last killing frost in the spring for Laramie as May 30; the average date of the first killing frost in the autumn is September 16. The bulletin does not institute comparisons with other stations throughout the country, but simply institutes comparisons with other sections or points at which there had been weather records in Wyoming.

1332 I consider our experiment station work in ensilage or silos important because the men engaged in the sheep industry or in the cattle business have been accustomed in Wyoming to shipping all their stuff out and have it prepared for market or finished. We have been experimenting with these Wyoming growing crops which can be produced successfully at an altitude like ours and an altitude of the average of southern Wyoming and we find ensilage of Canadian field peas and oats and barley successful. They have even started experiments with other grains, and ensilage of such material is very valuable indeed. The treatment is to cut these crops green and put them in the silo, where they ferment; the resulting product is ensilage, used as a fodder. Our idea is to permit the feeding of livestock here in order to bring it to a marketable condition rather than to have it shipped out of here and fattened elsewhere. The district yields itself readily to the production of livestock. The shortness of the season is indeed an important con-

sideration, because while the average is as stated here in this record naturally there are many seasons when the killing frost or the first destructive snows come earlier, and if these grains can be harvested when green and put into the silo the danger of loss is very much lessened. The season which I gave, according to the report in the

bulletin No. 100, Agricultural Station of Wyoming, is the 1333 average season for Laramie. In many cases we have frosts later than May 30 and earlier than September 16th. It would be putting it rather strongly to state that we have frosts at any time during the year. I cannot remember other statistics, but I do know that we have had frosts in June, and do know that there have been frosts in the latter part of August. There may have been some frosts not known to me in mid season. I was at Laramie only a part of last season. I remember a cold snap occurring about July 26th this year (1913). The damage was hardly material to the experiment farm. The man in charge reported to me that the loss was very much less than they feared. There was a good deal of loss at large in this region and also in other parts of Wyoming at that time. Frosts of that character are not uncommon at this latitude and altitude in the spring or in the fall. The number of such frosts occurring in what you might call the middle of the growing season I do not know.

1334 I do not have available any consecutive report about wind.

From the standpoint of personal comfort I know that we have a good deal of wind. Those winds are very apt to be cold and raw at times.

The application of water on the experiment station plats is of necessity different from the application of water on an ordinary piece of agricultural land, they naturally make the most careful measurements. The experimental tracts consist of small plats of this crop or that species of crop and next to it we have another one and they will be growing in rows or little blocks, so that they can be carefully observed and cared for minutely. Sometimes it will be a plot of an acre, and in other cases two acres, and last year I had pointed out to me that they had some plats of four acres for experiments. In some cases there is less than an acre and sometimes only a few rows. Sometimes we get a very small shipment of seed from the department at Washington.

Instead of having an impression that we were about to lose all of the available sources of water for irrigation I have an impression that if the Colorado project now under construction were carried through it would probably interfere with the continuous water supply that we find valuable from the standpoint of the work, that is not an expert opinion, it is an impression. If that impression were shown to be untrue my mind both individually and as President of the University would to that extent be relieved of the opinion that at present prevails, one of my troubles as President.

Cross-examination by Mr. Delph E. Carpenter:

1335 I think I was told of the severity of the frost of July 26, 1913. I believe I remember Prof. Parsons said the damage

was not anywhere near what they thought it would be. It is a fact that the records of the University show that frosts have occurred at the Station every month of the year in some years since the Station was established in 1891. The records show that they have occurred in June. I count nine years out of twenty where the temperature

was below 32 degrees in June. 32 is freezing but it is not  
 1336 counted a killing frost. Temperature during June has been 30 degrees Fahrenheit or below in 16 of the 20 years for which records are given on page 41 of our Bulletin 100. The table, however, does not give the day within the month, whether early or late. This same table shows two years in twenty during which there was a low temperature of 32 degrees Fahrenheit during the month of July, one in 1897 and one in 1904. The mean lowest temperature for June over a period of 20 years is shown to be 30.4 degrees Fahrenheit. During July over the same period 36.9. The records also show that during the year- 1891 to 1910, inclusive, six out of the twenty years show a low temperature of 32 degrees or less during the month of August. The mean low temperature over that period for that month was 33.9 degrees Fahrenheit. September, during the whole twenty years shows a low temperature of less than 32 degrees.

I have been at the University since August 1912. I have not so familiarized myself with the college work and the experiments as to be able to give the duty of water for irrigation for agricultural purposes.

1337 Our University is a co-educational institution. We have 108 men and 221 women.

Cross-examination by Mr. Charles F. Tew:

The budget of the Experiment Station included an expenditure of about \$40,000 each year. I describe the Station as being somewhat eccentric because of its location at its altitude and in the midst of these climatic conditions and winds. In that respect it is located in a place very different from the ordinary Experiment Station. I think it different from any in the United States and probably in the world. The experiments are of peculiar value because of these peculiar conditions. The experiments are made for obtaining and learning all we can in order to combat these adverse conditions in farming. The conditions here are less favorable to successful agriculture than in other circumstances.

1338 If we go by comparison, the conditions here are more adverse and less favorable than in most places where agriculture is carried on. That is because of the high altitude, the Experiment Farm has an altitude of 7,190 feet. There are climatic conditions other than the elevation, which are less favorable to agriculture in the vicinity of the station. The winds are one of these conditions. The soil is cold when the climate is cold. The water which is applied to the soil by means of the ditches from the streams is also relatively cold as compared with most irrigation ditches. That is what might be termed an adverse condition. I believe it is true, that the major portion of the Laramie Valley and the Little Laramie

also, which is devoted to agricultural purposes, is higher than the Laramie Station.

The latitude is not particularly unfavorable because agriculture in places of higher latitude is very successful, provided the altitude is much lower. I have seen that farming is successful here to a considerable degree at least. The comparison which I had in mind when speaking of the unique value of this Station is with other experiment stations and not a comparison between this exact location here and areas or farms under cultivation. I think I tried to point out that we believe this station to be of value to the agricultural industry of Wyoming particularly because of the average elevation of so large a body of Wyoming land, along the whole south it is practically the elevation of this station. Our hope is, and we seem to be realizing it in some degree, that we may demonstrate successfully methods of farming under such an approximation of conditions.

1340 The institution has been devoted to this series of experiments since its inception. They have been experimenting and demonstrating the different crops which can be grown under conditions existing in this region. During all that time the valley has, to a very considerable degree, been confined largely to experiments of those who engaged in hay culture. There is also a great deal of successful grain culture. The men who have paid most attention to that could give you the figures. Oats, barley, field peas, rye and such products. These are all limited in amount as compared with the area that is devoted to native hay. This native hay will survive the winds, continuous frosts, low temperature, cold water and cold soil, coming from high elevations and the conditions that are here; it would not be here native if it was not true.

Redirect examination by Mr. N. E. Corthell:

1340 The quality of oats raised here as compared with oats grown in lower altitudes is ranked high.

1341 The same is true of field peas, barley and potatoes.

The "mean lowest temperature" referred to is the mean of the extreme lowest temperatures occurring at any time during the month.

The attendance at the University is increasing.

1341 Recross-examination by Mr. Delph E. Carpenter:

In making my comparison of the quality of crops produced, it was not meant to be accurate, but by comparison with such crops as I have known in regions where I have lived, such as California, Oregon and Montana. I have no knowledge of the details of the work of the Agricultural College at Fort Collins, Colorado. I considered

1342 Wheatland, Wyoming, in general as to quality in making my comparison. In both the Wheatland and Laramie districts oats seem to be considered of good quality. That is all I am willing to affirm.

My immediate predecessor there was Charles A. Merica.

Recross-examination by Mr. Fred Farrar:

My professorship at Stanford University was in history and political science. I then went into executive work and do not claim to be an expert in agriculture. My work in the University here is very largely executive, having to do largely with the Agricultural Experiment Station as well as arts. I give lectures in history. I don't know whether I ought to say it or not, but I take a great interest in agriculture. I was a farm boy and lived on a ranch before

I went to college and did irrigating. I lived on a farm, as  
 1343 they always called them in Western Oregon, and then on a ranch in Idaho, on the Lost River Valley in the irrigation section. I was reared partly on a farm and partly in a little country town or village.

WINIFRED F. STUART, a witness in behalf of the Complainant.

Direct examination by Mr. N. E. Corthell.

1344 I am Deputy Commissioner of Public Lands of Wyoming. The map which I produce correctly shows the Wyoming State Lands within the Laramie River drainage basin. The Carey Act lands are designated by black India ink with crosses. The State lands leased to various lessees are designated by yellow crayon. The lands sold are designated by red crayon, the lands owned by the State but not yet patented to it are designated by a red cross hatch.

1345 The lands in solid red have been sold by the State but there are payments still due the State.

The Carey Act lands on the map amount to 51,788.22 acres. The other lands amount to approximately 255,000 acres. The lands sold but on which payments are due the State are approximately 5,000 acres. All the balance are unsold. The minimum price to the State for leases of lands is five cents per acre per annum. Some of the State lands are leased as high as 30 cents per acre per year. Probably all of these lands are leased except those sold.

1346 Ten dollars per acre is the minimum price at which lands are sold. All lands sold under the Laramie Drainage System have been sold at the minimum except 600 acres at \$12 per acre, and 640 acres at \$15 per acre. The tract sold at \$15 per acre was Sec. 16, T. 17, R. 74, Map offered in evidence, Exhibit P.

1347 The 600 acre tract is in Sec. 36, T. 14, R. 76.

1347 Cross-examination.

By Mr. Fred Farrar:

The minimum sale price of \$10.00 per acre is fixed by the Constitution of the state. The minimum rental price for agricultural lands or natural hay lands is 25 cents per acre; for grazing lands 5 cents per acre per year. In my direct testimony, in explaining the legend on the map, I mentioned lands which were not yet patented to the State. I referred to lands that had not been patented



by the Government to the State, received in lieu of other lands exchanged in forest reservations and such. They are what are termed "lieu lands." Carey Act lands come under the jurisdiction of the State Land Board, the same as other state lands, but they are separate, of course, from our state lands. The direct interest which the state has in Carey Act lands is 25 cents per acre, which we receive when the land is sold. The two tracts of land which I mentioned as having sold for more than the minimum price are

1348 located, one adjoining or within the boundary of the Riverside Ranch of the Laramie River, and the second one between the Little Laramie and the Big Laramie Rivers, near the confluence.

Cross-examination.

By Mr. Delph E. Carpenter:

The very fine dotted lines on this map indicate the several drainage areas of the tributaries to the Laramie River. In the Chugwater drainage area the colors on the map indicate some compact bodies of state land; I could not tell you to whom they are leased. The Swan Land and Cattle Company have considerable areas of leased land. It is very probable that these large, compact bodies on the Chugwater are leased by the Two-Bar outfit.

Cross-examination.

By Mr. Fred Farrar:

The Commissioner of Public Lands did issue a list for the period ending September 30, 1910, giving a list (not a part of the general edition) of all the leases and lands leased, but since that time no list has been issued. Another one would not be issued before September, 1914.

GUY H. DAYTON, a witness in behalf of the Complainant.

Direct examination by Mr. N. E. Corthell.

1350 The net number of country taxpayers within the Laramie River drainage district in Albany County for 1913, after deducting all duplications, was 1076.

Title was derived under the Union Pacific land grant to 556,487 acres of land within the Laramie River drainage basin in Albany County. The principal part of the City of Laramie is on U. P. land grant lands.

In 1913 Albany County paid to the State \$45,923.54 in taxes.

1351 Cross-examination.

By Mr. Delph E. Carpenter:

Of this net of 1078 actual country taxpayers outside of Laramie City in the Laramie River drainage area, there is included non-resident, as well as resident tax-payers. Our schedules and books show

the proportion of this 1078 taxpayers who are residents and the portion who are not residents. My rough conjecture would be that between 350 and 400 of these taxpayers are not residents. Assuming that there are only 350 non-resident taxpayers, leaving 728 out of town taxpayers in the Laramie drainage basin in Albany County, it would mean that a great majority of these are on irrigated ranches. They have their ranches along some little stream. Most of the 350 taxpayers who are non-residents represent land which is not irrigated. These non-residents are mostly people who bought land through these irrigation concerns. As to the remainder I think the majority of those live on irrigated ranches. That includes, of course, people in the livestock business, as well as those who are attempting to farm.

I stated that figure \$45,923.54 will be paid for state taxes, 1352 collected from all assessable property. The levy for state purposes is three miles. In my testimony on November 17, I stated that something over five million dollars of our valuation was on public utilities. These utilities consist of railroads. The Union Pacific is the main railroad. We also have the Laramie, Hahns Peak and Pacific. It is something over 58 miles long. The Union Pacific's business is primarily a transcontinental business. Laramie obtains some of its support from the Union Pacific Railroad but I don't think all of its support comes from the Railroad. It is a freight division. They have a small shop here. I don't believe they do a great deal of repairing, it is just light work. The main shops are at Cheyenne. A good many of the train crews stop here.

It is the terminus of the Hahns Peak Road. The Union 1353 Pacific has a tie-treating plant here. They have considerable trackage. There are four principal towns along the Union Pacific in Wyoming, a distance of about 400 miles; Cheyenne, Laramie, Rawlins and Green River. I can remember one time when they shut the shops of the Union Pacific in Laramie down and only ran the train crews, and the town of Laramie went right along the same way whether they kept their shops open or didn't. It might have been published that this was generally disastrous to the town, but it didn't kill the town.

1354 The last report of the payroll of the Union Pacific at this point, of which I heard, was in the neighborhood of \$250,000 a month. The Union Pacific has other property not included in the five million dollar figure which I gave. They have unsold lands and unsold lots. They have an acreage of about 15,000 acres of unsold land; it is all grazing land. The assessed valuation of the Union Pacific per mile is \$55,000 (corrected by later testimony \$52,000.00 per mile). I believe there are 80.15 miles of this 1335 road in this county. Most of it is double track.

Cross-examination by Mr. Charles F. Tew:

There is a railroad division for enginemen from Cheyenne to Laramie. For trainmen, I believe the division point is Cheyenne and don't include Laramie as a division point. There is another

division that runs on the Union Pacific from Laramie to Rawlins. It is a freight division. The traffic on the railroad, transcontinental and otherwise, is very heavy through Laramie. I think there are fewer crews going east from Laramie to Cheyenne than there are going west to Rawlins; it is a shorter division. A number of the crews that work on the railroad on the division to the west, reside in Laramie also. I believe the principal portion of the crew  
 1356 reside in Laramie. I believe there were thirty men employed at the tie-treating plant when we made the assessment last spring. Some of the engine men on the division between Laramie and Cheyenne stay at Laramie. The monthly payroll of the Union Pacific varies, it is more in some months than in others. A part of the payroll is expended here by these men in Laramie. Part of it has much to do with the valuations of business and other property here in Laramie.

There is a State University in Laramie. It is patronized by students who come from all parts of the State. That is a source of revenue to the City of Laramie.

There is a source of increase in value to Laramie from the railroad other than that I have mentioned, for I believe they put up ice here in the fall of the year, for use on the railroad.  
 1357 They begin putting up ice along in the middle of December.

#### Cross-examination by Mr. Fred Farrar:

The railroads are assessed by the State Board of Equalization composed of the Secretary of State, State Auditor and State Treasurer. They do not assess property belonging to railroads and not used for railroad purposes. They do, however, assess everything directly connected with the operation of the railroad. I don't believe the State Board of Equalization assesses roundhouses, hotels and property of that kind. That doesn't go into their right of way, that is a separate assessment made by the county assessors. The State Board of Equalization assesses roundhouses, rights of way, stock yards, water tanks, section houses, ice plants and things of that kind. I do not know what method is adopted by the State Board of Equalization in arriving at the valuation of railroads in this state. The returns we receive from the State Board of Equalization shows there are 80.15 miles of railroad in the county assessed at \$55,000 per mile (corrected by later testimony, \$52,000. per mile). I believe it is 16.08 miles to Hermosa assessed at \$20,000 per mile.  
 1358 There is in the neighborhood of 60 to 62 miles of railroad of the Laramie, Hahns Peak and Pacific Railroad. That is assessed at \$5,000 per mile.

1359 We have a standard valuation on live stock fixed by the State Board of Equalization. They are: Class 1, cattle, thoroughbreds, coming yearlings, \$25.00 per head; Class 2, bulls, thoroughbreds and other kinds, \$50.00 per head; Class 3, cattle, calves, coming yearlings, \$15.00 per head; Class 4, cattle, yearlings and over, \$30.00 per head; Class 5, common milk cows, \$35.00 per

head; Class 6, dairy cattle, used for commercial purposes, \$40.00 per head; sheep, bucks and thoroughbred sheep, yearlings and over, \$7.00 per head; sheep, lambs, coming yearlings, \$2.50; sheep, yearlings and over, \$3.50; Horses: pure bred and thorough bred stallions, \$300.00; pure bred and thoroughbred stallions coming yearlings, \$150.00; pure bred mares and grade stallions, \$150.00; pure bred mares and grade stallions coming yearlings, \$75.00, carriage horses, driving high grade mares and heavy draft horses, \$125.00; common unbroke horses and mares, \$30.00; ranch, dray work and livery horses, \$65.00; saddle horses and cow ponies, \$40.00; shetland ponies, \$20.00; Mules: asses and large jacks used for breeding purposes, \$200.00; heavy draft mules, \$125.00; ordinary mules, \$75.00; burros, \$10.00; Swine: pigs under six months, \$2.00; hogs, six months and over, \$7.00; goats, \$4.00.

Our returns show that under the 1913 assessment of Albany county there were 27,428 cattle, 90,922 sheep, 4,293 unbroken horses and mares, and 7,336 total horses, and 342 hogs.

#### 1361 Cross-examination by Mr. Charles F. Tew:

I have examined the records in my office from which I am able to state the assessed valuation of the lands and improvements thereon of several of the ranches in Laramie Valley and Little Laramie Valley, in the County of Albany, for the tax year of 1913. The Hogue Ranch is owned by the Denver-Laramie Realty Co. On that ranch there are 45 acres of cultivated land assessed at \$20.00 per acre. There are 1,569 acres natural hay land at \$15.00 per acre. There are 1631 acres we term irrigated grazing land at \$5 per acre. There are 5180 acres of pasture land at \$3. per acre. The aggregate area of the Hogue Ranch is 8,225 acres. On the whole 1362 acreage there is one set of buildings, assessed at \$4,000.

Those buildings consist of barns and sheds. There are 13¾ miles of fence assessed on that land. It is valued at \$31.20. That comprises the total assessment of this land.

In my classification I have one class at \$15.00. That is uncultivated native hay. The 45 acres class at \$20. per acre is cultivated land. That means it has been broken and is in alfalfa or grain.

The Iron mountain Ranch, also known as the Boughton Ranch, is partly under the Boughton Ditch and partly under the Laramie River. There are 24,020 acres in the ranch. I don't believe there are any cultivated acres. There are 2,000 acres of native hay land assessed at \$20. per acre. The other class of land on that ranch is grazing, 22,020 acres assessed at \$2.00 per acre. There is but

1363 one set of improvements on it assessed at \$1,100. The fence is assessed at \$360.00, I don't know how many miles. There is a small mileage compared with the number of acres.

I will give the total area of the lands assessed, the description of the buildings on each ranch, the classification into which the lands are divided for assessment, the number of miles of fence on each ranch and the assessed valuation fixed for each class of lands and the total assessed valuation of the improvements on the following ranches:

The Hart Ranch: buildings, \$2,000; fence, \$235; 600 acres cultivated lands, \$20. per acre; 700 acres uncultivated lands or meadow lands at \$20. per acre; 11,691 acres grazing land at \$3. per acre; a total area of 12,991 acres.

Blackburn Ranch: Buildings, \$5,600; fence, \$500; 500 acres cultivated land at \$22 per acre; 1,390 acres cultivated land at \$25 per acre; 300 acres meadow land at \$15 per acre; 60 acres meadow at \$20 per acre; 75 acres irrigated grazing land at \$7 per acre; 800 acres irrigated grazing land at \$5 per acre; 2,295 acres grazing land at \$2; 160 acres at \$2.50; 4,370 acres at \$3; 480 acres at \$1.75; area, 10,430 acres. I will say in regard to the Blackburn ranch that that has been assessed part to the Laramie Development Company and some to L. H. Humphrey, James Morland, C. and A. Morrison, L. B. Pinton, W. A. Radcliff, O. Turnquist, G. Wessels, and H. Wessels.

Keystone Ranch: Buildings \$2,000; fence, \$600; 80 acres cultivated land at \$23; 1,020 acres meadow land at \$20; 1,920 acres irrigated grazing land at \$10; 3,542 acres irrigated grazing land at \$5; 6,562 acres total area. This ranch is also known as the Ernest Ranch.

Sprague Ranch: Buildings, \$1,200; fence, \$330; 640 acres meadow land at \$20; 320 acres meadow at \$23; 960 acres meadow at \$21; 1,960 acres grazing land at \$2; 9,927 acres, value \$31,620 at about \$3.25 per acre; 13,167 acres at \$3.00; total area, 26,974 acres.

Estate of S. W. Gillespie: Improvements, \$580; 100 acres meadow land at \$20; 364 acres at \$2.00; total 464 acres area.

Maggie Gillespie: 2,894 acres at \$3.00.

Maggie Gillespie desert entry: Improvements, \$550; 307 acres of grazing land at \$2.00.

John McGill ranch, along the Laramie River: Houses, \$1,500; sheds, \$500; fence, \$500, 200 acres meadow land, \$4,000; or \$20. per acre; 100 acres irrigated grazing land at \$7.00 per acre; 2,143 acres grazing land at \$2.00; total area 2,443 acres.

J. T. and T. B. Dodge: Barn, \$100; house, \$100; fencing, \$120; 45 acres meadow land at \$15; 799 acres grazing land at \$2.

I have a portion of the Millbrook ranch; That portion lies on the Little Laramie River. It is the best portion, that is the meadow land and the grazing land that lies to the north and west. The Millbrook ranch is divided now so that there are several owners. The following several portions are assessed to the following persons and show the following improvements and assessments:

C. P. Arnold: 100 acres meadow land at \$20 an acre; 60 acres at \$2.00 per acre; 50 acres at \$20; 2,562 acres at \$2.

William Conyers: House and barn, \$600; 180 acres meadow land at \$20; 20 acres grazing land at \$3.00.

W. J. Dallas: 240 acres meadow land at \$20; 40 acres grazing land at \$3.00.

William Irvine: Improvements, \$1,000; 250 acres meadow land at \$20; 70 acres grazing land at \$3.00.

Bert Hoss: 120 acres at \$20.

Knud Knudsen: 320 acres at \$20; 80 acres at \$3.00.

Millbrook Land & Livestock Company: Improvements, \$3,100; 300 acres cultivated lands at \$20; 170 acres meadow land at \$20; 100 acres irrigated grazing land at \$10; 13,765 acres at \$51,300 value; 400 acres grazing land at \$2.00.

Julius Puls: Barn and house, \$500; fence, \$100; 400 acres meadow lands at \$20; 166 acres grazing land at \$3.00.

Allen Scoville and estate of E. J. Bell: house, \$500; fence \$100; 193 acres meadow land at \$20; 927 acres grazing land at \$3.00.

Other ranches (not part of the Millbrook):

The Oscar Sodergreen ranch shows, house \$1000; barns and sheds \$600; fence \$500; 350 acres meadow land at \$20.00 per acre; 4750 acres grazing land at \$3.00 per acre: total area 5,100 acres.

The Augusta Sodergreen ranch: 293 acres at \$3.00.

Charles Benson ranch: House, \$150; barns and sheds, \$150; fence \$100; 140 acres meadow land at \$20; 280 acres grazing land at \$3.00; 420 acres total area.

W. P. Shott ranch: This is a part of the Fisher and Popp place; fence \$30; 35 acres cultivated land at \$25; 80 acres meadow land at \$18 per acre; 40 acres meadow land at \$20 per acre; 1,005 1366 acres grazing land at \$3.00 per acre. 1,160 acres total area.

John Biddick: house \$300; barn \$100; fence \$100; 100 acres meadow land at \$20; 260 acres at \$3.00; 360 acres total area.

H. R. Ingham: 150 acres meadow land at \$20; 690 acres at \$3.00; 850 acres area.

H. R. Ingham was once assessor in this county.

Estate of M. A. Carroll: Improvements \$500; 200 acres meadow land at \$20; 440 acres grazing land at \$3.00; total area 640 acres.

Carroll and Ingham: 2,940 acres at \$3.00 per acre. The last three include the Ingham ranch.

The John A. Fischer tract of land has been sub-divided into different tracts to different people. The first tract is Sec. 7, Tp. 14, R. 75 W., and is included in the assessment of W. P. Shott as already given. All of Sec. 8 is owned by C. L. Brinkerhoff: 25 acres cultivated land at \$25.00 per acre; 200 acres meadow land at \$20 per acre; 595 acres grazing land at \$3.00 per acre. All of Sec. 9 assessed at \$3.00 per acre, 640 acres, and all of Sec. 17.

H. and B. M. Grable: house \$500; barns \$500; fence \$20; 20 acres cultivated land at \$25 per acre; 50 acres meadow land at \$20 per acre; 555 acres irrigated grazing land at \$5 per acre.

The north half of Section 21, A. M. Lunt: improvements \$1,000; 160 acres cultivated land at \$20 per acre; 160 acres grazing land at \$3.00 per acre. This is all in Tp. 14, R. 75 and is the Fischer ranch.

Yesterday I stated the assessed valuation of the Union Pacific by the State Board of Equalization was \$55,000 per mile. That is an error, it is \$52,000 per mile. There was an assessment by the State Board of Equalization of the Laramie and Hahn's Peak and the Union Pacific. The Union Pacific Company, 80.15 miles at \$52,000 per mile, the value would be \$4,167,800. The Union Paci-



fic Railroad Company, Hermosa Cutoff 16.08 miles at \$20,-  
 1367 000 per mile, \$321,600. Laramie, Hahn's Peak and Pacific  
 Railroad Company, 67.47 miles at \$5,000 per mile, total  
 \$337,350.

Of the several branches which I have described, I am generally acquainted with the character of each. I have been on the Millbrook Ranch and the Ernest or Keystone Ranch; also the Blackburn Ranch. I would think that the Blackburn Ranch differs from the other ranches in the fact that the greater portion of it is devoted to agricultural use and the raising of crops than is general in the Laramie Valley. It is the best farmed ranch in the Valley. It is therefore a ranch of higher value than the general valuation of ranches throughout the valley. I would also call the Ernest Ranch and the Millbrook ranch high-class ranches. These two ranches are more largely devoted to hay culture than the average ranch in our assessment in the Laramie Valley. They have the biggest area of hay land. They have the largest area relatively, and therefore are the most valuable of the ranches. John Ernest was the owner of the Ernest or Keystone ranch. He is now  
 1368 a member of the Board of County Commissioners. He has disposed of the ranch. The Board of County Commissioners sitting as a Board of Equalization raised the assessment of the old Ernest Ranch 1,920 acres to \$10 per acre and 3,542 acres at \$3.00 to \$5.00 per acre. The other ranches that I described this morning, other than the Millbrook, Keystone and the Blackburn, are ranches of the general character throughout the county. Some of these run better and some not so good as the three I have named. The Hart Ranch is an example of one of these. There is raised a little alfalfa on this ranch. It is one of the very best ranches.

The Hart Ranch is known as the best alfalfa ranch in the valley.

The Sodergreen place is among the best of the hay ranches.

1369 The ranches I have given are particularly up to the average.

In Albany County, according to my abstract of assessment, we found a total of approximately 53,000 acres of natural hay meadows. Of that there are 48,000 acres which are ranches containing hay meadows irrigated from the Laramie River and tributaries, including Sibville Creek and all tributaries of the Laramie River in Albany County. Also the drainage basin of the Little Laramie.

Redirect examination by Mr. N. E. Corthell:

1369 Some of the assessments to which I have testified in cross examination were made by me, but not all.

1370 The assessments for property of non-residents were made in the office. The list of assessments I have testified to was made up under direction of attorneys for defendants after an inspection of the assessment schedules. I looked up and testified concerning such assessments as I was requested specially to mention.

1371 These assessed values have very little relation to the price paid upon sales of these properties.

The Sprague ranch is assessed at \$59,150. I believe it sold within the last two years at \$6.00 per acre.

Recross-examination by Mr. Charles F. Tew:

1372 We try to have our assessment throughout the valley uniform for these hay ranches. These ranches which I have described show assessments which are alike in character to the other assessments I have placed on other ranches for this tax this  
1373 year.

Yesterday when counsel visited our office they were there but for a very few moments. They did not go over the entire assessment to pick out particular assessments. It is true that I was requested to pick from the list that was handed me, the assessment of ranches that would be fairly expressive and descriptive of the character of assessment of hay ranches throughout the Valley. I was cautioned to do that. It was brought to my attention to choose some of the very best ranches, for example the Blackburn ranch. It was asked of me if that was one of the best. The same is true of the Millbrook, the Hart and the Keystone ranches. I did choose some of the very highest classes of ranches to give my example here. The time that I had to give was that limited that I could not give all of the assessments in the whole valley. Consequently counsel gave me instructions to pick throughout the valley in different portions so as to give a fair sample of the average assessments. I did that.

The total value of lands or properties assessed against the Union Pacific Railroad, exclusive of the trackage and outside the City of Laramie in the year in question is \$234,475. These lands  
1374 are in the main open lands, that is lands not used for hay meadow, but range lands. All the land the Union Pacific has in the county are rangelands. It is open land which the stock runs over. The same is true of a large amount of the lands of the state, as well as public domain that lies adjacent to the ranches, the assessments of which I have spoken of. Most of the ranches we have described are in the cattle business. The persons occupying these ranches graze stock not only over the areas which I have described as assessed to them, but enjoy the use of this open public range adjacent to their lands. The cattle business of the men consists of these ranches up and down the river used in conjunction with these open lands. I do not believe that the owners of these ranches limit their operations to the particular area I have given. The cattle and sheep and horses and stock range remote from the ranch house and ranches many miles. We have some farm-  
1375 ers here, but speaking generally of the country, the whole country is a cattle, sheep, horse and ranch country.

The complainant then rested its case.

(End of Transcript, Vol. 3, Complainant.)

In the Supreme Court of the United States.

In Equity.

No. 8, Original.

1376

THE STATE OF WYOMING, Complainant,

vs.

THE STATE OF COLORADO, THE GREELEY-POUDRE IRRIGATION DISTRICT, a Municipal Corporation; The Laramie-Poudre Reservoirs and Irrigation Company, a Corporation, Defendants.

The Complainant having rested its case in chief in the above-entitled action the following evidence was introduced before Newton C. Garbutt, Special Commissioner, by and on behalf of the defendants, commencing December 15, 1913.

#### Appearances:

For the Complainant: D. A. Preston, Esq., Attorney General of the State of Wyoming; N. E. Corthell, Esq., John D. Clark, Esq.

For the Defendant, the State of Colorado: Fred Farrar, Esq., Attorney General of the State of Colorado.

For the Greeley-Poudre Irrigation District: Delph E. Carpenter, Esq., Charles F. Tew, Esq.

For the Laramie-Poudre Reservoirs and Irrigation Company: Julius C. Gunter, Esq., Denver, Colorado.

1376 JOHN E. FIELD.

Direct examination by Mr. Fred Farrar:

I am a civil engineer. Was born in Colorado in 1867. I am the present State Engineer and Engineer of the Land Board. As State Engineer, I have supervision of the distribution of water supply, particularly: also the compilation of data in regard to water supply and the examination of ditches and dams and any other engineering work that the State happens to undertake. Under the law of Colorado the State Engineer is at the head of what you might call the irrigation department, which includes water commissioners and superintendents of irrigation. The sub-ordinate officials having charge of the distribution of water are five division engineers, and the water commissioners. The division engineers, each one having charge of a main drainage area, are directly responsible to the State Engineer. The division engineers are over the water commissioners; there are sixty-seven of these in the State, and, of course, each water commissioner has one or more deputies.

I assumed office of State Engineer April 1, 1913. I was State Engineer before from April, 1897, until April, 1899, and was deputy state engineer from December, 1900, until April, 1903. I was educated in the public schools in Denver, graduated from the high

school in 1885 and then went to Sheffield Scientific School of Yale University, where I graduated in 1888, from the Scientific School and the engineering division. After I graduated I took one year of post-graduate work, finishing in 1889. During my college and post-graduate courses I made a specialty of hydraulics. As to my experience both from a practical and professional standpoint in irrigation matters, I will state I was born in the State of Colorado on a farm which was irrigated, and during my entire life up to the present time I have been engaged more or less with irrigated farms, especially after I graduated from college. As early as 1879, my father, who was a civil engineer, taught me the use of the instruments and that sort of thing. I worked with him during two or three

summers on the ranch. The rest of my vacations were all 1378 most entirely spent on the farm, where I learned irrigation in a practical way, and that, coupled with my ability to run the instruments so qualified me that I laid out ditches and built some few reservoirs, even before I went to college. After I graduated from college, I went into the mines at Aspen, where I had some experience in tunneling, and general mining operations. In 1893, the depression in the mining field was such that I returned to Denver, and from that time until 1903 I had charge of the several farms which belonged to my father, one consisting of 400 acres in Boulder county. That was an irrigated farm. He had two farms also on the Arkansas river near Swallows, about seventeen miles west of Pueblo; and he also had several hundred acres of land south of the city of Denver under the City Ditch, and it was my duty to relieve my father to a large extent, in the operation of those farms. Between the years 1893 and 1897, I was chief examiner in the office of the United States Surveyor General for the District of Colorado, and during that time I made ditch surveys to help out in making a living. During the two years that I was State Engineer, the duties were almost entirely devoted to the settlement of dispute of the distribution of water in the State. During the two years intervening between the time I was State Engineer and Deputy State Engineer, I constructed the storm sewers in the City of Denver in what is known as the Capitol Hill District. After my term of Deputy State Engineer in 1903, I went to work for the United States Reclamation Service under the Reclamation Act. I was with them until August, 1907, and during that time I made investigation of the Sweet Water Project.

1379 The Sweet Water is a tributary of the North Platte River, enters the North Platte River some fifty miles southwest of the town of Casper, in the State of Wyoming. The Sweet Water reservoir was intended at that time to furnish water if different Government projects should be built upon the North Platte river in Wyoming and Nebraska. I discovered that the water supply there, however, was insufficient. In July, 1903, I started out to find some other reservoir site. I had been informed that there was a reservoir site on the North Platte river. I sought that out, and the site which was located by me for that is now known as the Pathfinder Reservoir.

I continued in charge of that work until the laying of the masonry began, that is, I made the surveys and the calculations, etc., in reference to the Pathfinder; made investigations as to a dam site, built the tunnel, and did the preliminary work. During this time, also I investigated the North Platte river in Wyoming south of the Pathfinder Reservoir, that is to say, in the vicinity of the town of Saratoga, Wyoming, on behalf of the Government I examined two projects, each of which contained something over 50,000 acres. I also investigated these lands and the possibilities of ditch building between the Pathfinder Reservoir and the Wyoming-Nebraska State line. I had surveys run on both sides of the North Platte river beginning above Casper and extending, as I say, clear to the State line, and even beyond into the State of Nebraska. I made an examination of what is known as the Goshen Park Project; had those surveys and investigations made. Also the project practically completed, the Interstate project, which canal heads in the State of Wyoming just below the town of Guernsey and extends for a distance of about 50 miles through the State of Wyoming covering perhaps 40,000 acres of land in the State of Wyoming.

This canal extends still farther eastward into the State of Nebraska and in original plans was to cover about 160,000 acres of land in the State of Nebraska, on the north side of the North Platte river. The Goshen Park project contemplated the irrigation of some 200,000 acres of land on the south side of the Platte river. I left the Government service in August, 1907, returned to Denver and opened up an office for private practice.

My investigation of these Government projects led me into a study of the tributaries of the North Platte river. I made investigation of the Laramie River and all of the Wheatland country at that time, with the particular object of ascertaining the water supply and what effect the development along the North Platte might have. I concluded at that time that the Laramie river valley was very well covered by private enterprises, and that its development would proceed and that there was no necessity of the Government going into the Laramie Valley at that time, and that though we might use all of the waters of the North Platte river, that it would in no way interfere with the irrigation of the Laramie Plains; further, that the waters from the Laramie, although they might be used by diversions above the mouth of the Laramie, would not interfere with the development on the North Platte river. In my private practice I have also had occasion to examine numerous projects in the State of Wyoming; the Eaden project, north of Rock Springs, and the Riverside Ranch. I made a particular investigation of this ranch on the Laramie river, some twenty miles above the town of Laramie. I have also done quite a little work in the vicinity of Sheridan and Clear Creek and Little Goose and Big Goose Creeks, in Wyoming. The diversions from the Tongue river over into West Pass and East Pass from the Parkman Irrigation District. This district lies in the State of Wyoming, along the Wyoming-Montana line. Also in my private practice,

since 1907, I have examined and reported on projects in Oregon, Texas and New Mexico. These were irrigation projects.

In answer to your question directing me without further interrogatory to give a general geographical and topographical review of the States of Colorado and Wyoming, giving particular reference to the Laramie and the Poudre rivers, I think it is well, at first, to state the general location of Colorado and Wyoming, with reference to the rest of the country.

Colorado occupies a rather unique position in the inter-mountain region which includes within its boundaries a portion of the crest of the continent. This continental divide extends from the Canada line to the Gulf, and Colorado caps the pinnacle of this divide. This continental divide is popularly known as the Rocky Mountains. In Colorado it is divided into several mountain ranges, beginning on the north and west of North Park as the Rabbit Ear Range, it swings around the south end of North Park south some fifty miles to the point where it joins the Medicine Bow Range, which is the dividing range between the Laramie river and the North Platte river. It is also the point where the headwaters of the Cache la Poudre are separated from the Laramie river; and the point where the headwaters of the Grand river are separated from those of the North Platte, the Laramie and of the Poudre. At one point practically all of these streams separate, part of the water flowing to the Pacific, and part into the Gulf of Mexico. The

1382 Continental Divide extends further south and is known as the Green and the Front Range and in Central Colorado as the Williams Mountains. In the extreme south it is known as the Cochetops.

There are perhaps three mountain ranges extending more or less continuously through the width of the state of Colorado, and between these mountain ranges are mountain parks. The most northerly in Colorado is known as North Park, then further south Middle Park, South Park and the San Luis Valley. The Laramie Plain in Wyoming might also be considered as one of these parks inclosed by high mountain ranges.

The drainage in the State of Colorado flows in all directions and there is almost without exception, no stream entering the State of Colorado from any other state. A few small streams, dry during part of the year, cross the northerly boundary of Colorado from the State of Wyoming, such as Lone Tree and Crow Creeks. A partial exception to this rule might be the Little Snake river which heads in both Colorado and Wyoming. The greater run-off, however, I believe comes from the State of Colorado. The Mountains in Colorado being higher and I believe the precipitation greater. The Little Snake river itself crosses and re-crosses the Colorado-Wyoming boundary line, finally entering the State of Colorado and is tributary to the Yampa or Bear river which, in turn, is tributary to the Green and of the Colorado, which flows into the Gulf of California.

On the other hand the North Platte and the Laramie rivers flow from Colorado northward into the State of Wyoming. The North Platte discharges into the State of Wyoming probably something in



excess of one million acre feet, while the Laramie river and  
 1383 its drainage discharges into the state of Wyoming about a  
 quarter of a million acre feet annum. On the western side  
 of Colorado and the eastern boundary of Utah is the Green river  
 which rises in Wyoming, passes through a corner of Utah, loops into  
 Colorado for a short distance and finally enters the state of Utah and  
 forms one of the tributaries of the Colorado.

The Yampa, sometimes also called the Bear river, the White,  
 the Grand and the Dolores, also flow from the State of Colorado,  
 westerly into the State of Utah, and they contribute to the streams  
 of other states an aggregate of about eight million acre feet per an-  
 num.

On the south are the La Plata, Las Animas and San Juan, which  
 cross the southern boundary of Colorado into New Mexico and ulti-  
 mately join the Colorado river in Utah. These streams discharge  
 about two million acre feet per annum.

The Rio Grande river drainage also crosses south. It arises in  
 Colorado east of the Continental Divide and it and its tributaries  
 discharge about a million acre feet per annum on the average from  
 Colorado into the state of New Mexico.

On the easterly side of Colorado are the South Platte, the Re-  
 publican, the Arickaree and the Arkansas. These streams discharge  
 water into Nebraska and Kansas in amount probably one million  
 acre feet per annum.

It appears, therefore, that the streams in the State of Colorado dis-  
 charge into other states something over thirteen and one-half million  
 acre feet per annum at present.

The State of Wyoming is situated similarly to the State of  
 Colorado. Its average elevation is greater than Colorado, though its  
 mountain peaks are generally not quite so high. We find within  
 its boundaries the tributaries of the Missouri, the Yellow-  
 1384 stone, the Big Horn, the Tongue and the Powder rivers cross-  
 ing into Montana. To the west the Snake river and its  
 tributaries pass into the State of Idaho, and to the south the Green  
 river flows into the state of Utah. To the east, the North Platte  
 and Niobrara flow into the state of Nebraska, while the Belle Fourche  
 and the South Fork of the Cheyenne flow into the state of South  
 Dakota.

Both the state of Colorado and Wyoming are in the semiarid  
 region where irrigation is necessary to successfully grow agricultural  
 crops, and these two states furnish a large part of the water necessary  
 to the agricultural land of the adjoining states and to states as far  
 distant as southern California, south-western Arizona, Old Mexico  
 and Texas. On all of these interstate streams there is the question  
 of relative rights of the states, and the rights of the individuals  
 within the states. Colorado on account of its geographical and  
 topographical location and elevation is made defendant in all inter-  
 state suits, while Wyoming is made defendant in all suits with other  
 states with the exception of the state of Colorado. When I say de-  
 fendant, I am speaking in the abstract rather than the concrete. By  
 defendant I mean it defends the right to use all water within its

borders. Already Colorado has had litigation with the state of Kansas. A suit has also been filed concerning the waters of the Republican river by citizens of the state of Nebraska. And, in my opinion, unless one of the suits now pending is settled definitely there will be litigation on all interstate streams and questions will arise in reference to the waters claimed by New Mexico, Texas, and Old Mexico on the Rio Grande, and of Arizona, California and Utah, regarding the tributaries of the Colorado river in the state of

Colorado, and of Nebraska in reference to the waters of the  
1385 South Platte river.

The Continental Divide is near the center of the State of Colorado, the western portion of the state is mountainous and very broken. In the extreme western portion what was originally a very high plateau, has been so eroded that the amount of agricultural land is small and the valleys are proportionally narrow. To the casual observer it is what would be called a mountainous country, while east of the Continental Divide we have the Great Plains where the country is rolling and quite level. The elevation of these plains varies from four thousand to a little over five thousand feet, while on the western slope only the valleys are below five thousand feet.

The distance from the eastern edge of the mountains to the state line is something over two hundred miles. Of the four streams flowing to the east; the South Platte, the Republican, the Arickaree and the Arkansas, the Republican and the Arickaree head on the Great Plains and are quite small. The South Platte and the Arkansas both

head in the Continental Divide and are streams of considerable magnitude. With reference to these streams which run to the east, there is some accretion aside from seepage and return water from irrigation. The plains region, however, does not furnish a very great run-off, and that portion or the Great Plains tributary to these streams, probably does not discharge much over 1/10 of a foot of water in depth over the water sheds into the streams; that is to say, from a section of land of 640 acres, probably 64 acre feet would represent as much as is discharged on the average into these streams.

The South Platte and Arkansas Rivers decrease, under natural, normal conditions, as they cross the plains on the eastern side of Colorado after they leave the mountains, except at such times as when very heavy rains discharge large amounts of water into the streams, when we would have what we call a flood or a cloud burst. These conditions differ by contrast from the streams in the eastern portion of the United States, especially out of the arid region, where there would be a gradual increase in the streams naturally. In these streams there would be a natural decrease until they reach the area of increased precipitation, except for those erratic cloud bursts I speak of. The next result probably would be a very considerable loss of water after the rivers reached the plains region out of the mountains and out of the foothills.

1387 This condition is modified by irrigation, there is a very considerable return of water on account of irrigation. The result is to materially increase the low flow of the streams. The short flow period is decreased. On the South Platte river the return

seepage is such that it is estimated that one-third of all the water which is diverted from the stream returns in the form of seepage and return water. Those return waters furnish about the entire supply of the river after it leaves the hill region. Its line of demarcation would pass about through Denver and the town of Greeley and the town of Cheyenne. From that point east, by far the greater part of the water used for irrigation is from return and seepage water. I am not able to state from personal knowledge whether or not there is more or less water flowing in the streams at the eastern end of the state, except during the flood seasons, than there was before irrigation commenced, but records, however, can be consulted, and from my reading of the historical accounts of the early experiences along the South Platte, I am led to believe that the amount of water which crosses the Colorado-Nebraska line is very much greater during the low flow than it was before. The area involved in this suit lies in both Colorado and Wyoming.

1388 The waters in controversy arise in the State of Colorado, but the areas of land which are involved are in both states.

The Laramie Valley in Colorado lies about the center of the northern boundary of that state. The drainage area of the headwaters of the Laramie river and the headwater- of the Cache la Poudre are adjacent and interlaced, for the Continental Divide, crossing the Colorado-Wyoming line west of the North Platte river drainage, swings east more than fifty miles around the south side of North Park and joins the Medicine Bow Range and the Green Mountains at about the same point, the Green Mountains being the mountain range separating the Laramie river drainage from the Cache la Poudre drainage. At this point the range swings to the south and is known as the Front Range and divides the headwaters of the South Platte from those of the Grand river; that is, it divides the waters of the Atlantic from those of the Pacific slope so that at this point we find the divide separating the headwaters of the North Platte and Laramie river, a tributary of the North Platte, and the Cache la Poudre, a tributary of the South Platte, as well as separating these branches from the Grand river drainage which flows into the Pacific.

1389 From a position at the head of the Big Laramie river in Colorado, looking to the north, there lies in front of the observer the Laramie river valley extending nearly due north until it crosses the Colorado-Wyoming line. The valley in Colorado is very narrow with bottom lands mostly growing wild hay. These meadows are scarcely more than a mile in width and are bordered by mesa or bench lands extending back to the hills on both the easterly and westerly border of the valley. The valley is possibly less than one-half mile wide at its upper end and widens gradually to the state line, being in some places two miles in width. At the state line the Laramie river enters a narrow cañon which ends in the vicinity of Woods Landing, some ten miles north of the Colorado line; thence the river flows in a northeasterly direction traversing the Laramie Plains proper to their northerly extremity, where it turns abruptly to the east, breaks through the rim of the valley,

drops some two thousand feet in elevation, passes through the ridge and skirts the northerly edge of the Wheatland country and enters the North Platte river at Old Fort Laramie.

Old Fort Laramie was almost the first settlement made upon the Laramie or upon the North Platte river. It was founded about 1838, was purchased for a Government Post, and in 1848 was one of the most important outposts and stopping places for the gold seekers of California, the Mormon immigrants, the Oregon settlers and other westward bound people. So that this section at least, was well known in the earliest days.

To the observer standing at the head of the Laramie river, there appear two ranges of mountains diverging one to the west and extending in a northwesterly direction, forming the watershed between the Laramie river and the North Platte drainage, and the other extending northerly and in a slightly easterly direction, forming the watershed between the Laramie and the Cache la Poudre rivers.

The watershed between the Laramie river and the North Platte river is known as the Medicine Bow Range and extends northward into Wyoming about 50 miles. By watershed I mean divide. It divides in Wyoming into several spurs, the more prominent of which are the Sheep and Centennial mountains. Many of the peaks of this range in Wyoming reach an elevation of more than ten thousand feet. Clark's Peak in Colorado reaches an elevation of about 13,000 feet. Medicine Bow Peak in Wyoming is credited with an elevation of from 12,005 to 12,231 feet, depending upon the authority consulted, a few of the lower peaks are less than 10,000 feet and throughout Wyoming the range appears to have an average elevation of almost 10,000 feet. The passes in both Colorado and Wyoming are close to 9,000 feet in elevation. This range in Wyoming, including its spurs, is somewhat wider than in Colorado. The Laramie and North Platte rivers diverging somewhat as they flow northward. Numerous tributaries of the Laramie and of the Little Laramie rivers head in the Medicine Bow Range. They flow in a northeasterly direction in Colorado and in a general easterly direction in Wyoming.

Beginning at the southerly end of the drainage area, the following tributaries of the Big Laramie discharge water into the Laramie on the west side: West Fork, Mill, Fall, Rapid, Springer, Rawah, Link Creek, Stub, McIntyre, La Garde, Forrester, Grace and Stuck. Those reach the Laramie river before it crosses the Colorado-Wyoming line and above the gauging station known as Boswell, State Line or Jelm Station.

1391 Those reaching the Laramie river in Wyoming and heading in the State of Colorado, are Johnson and Beaver creeks. Those rising in Wyoming are North Branch of Beaver Creek, Bear, Wood and Fox creeks.

The Little Laramie river has the following tributaries, all, of course, in the State of Wyoming, and heading west of the Laramie Plains, and in the Medicine Bow range and its spurs; Buckeye,

Hecht, South Fork, Middle Fork, Mallen, Liby, Nash, North Fork and Mill creeks.

North of the Little Laramie drainage the streams which head in the Medicine Bow range or its spurs are Seven Mile, Four Mile, Cooper and Dutton creeks. All of these streams are quite permanent in their character, and derive their waters either from the snows of winter or from the summer rains which are abundant throughout the Rocky Mountain regions in the months of July and August.

A remarkable condition exists at the head of the tributaries of the Little Laramie river. Near the head of Nash and Libby creeks, tributaries of the Little Laramie, there are a great many mountain lakes fed by the snows of the high peaks, causing a natural equalization of the flow of the creeks.

On the easterly side of the Laramie Valley the mountain range or divide between the Cache la Poudre and the Laramie rivers is known—in its southerly extremity—as the Green Mountains, the latter being sometimes called the Laramie Mountains, and extending to the cañon where the Laramie river cuts through the ridge. These mountains extending north of the Laramie river are generally known as the Laramie mountains, terminating in Laramie Peak.

1392 The Mountain range bounding the Laramie Valley on the east, in the State of Colorado, discharges a considerable volume of water into the Laramie basin. Beginning at the southerly terminus of the Laramie Drainage area the most important tributaries flowing into the Big Laramie are: Half Mile, Springer, Brinker, Porter, Deadman and its tributaries, Nunn Creek and Jimmy Creek; all reaching the river in the State of Colorado.

The most important tributary of the Big Laramie river from the east is Sand Creek. This creek obtains practically all of its water supply within the State of Colorado from the westerly slope of Green Mountains and Boulder Ridge, but it flows northerly and does not enter the Big Laramie river until within some eight miles of the town of Laramie. It has several tributaries such as Shell Creek; Antelope Creek might also be considered as a tributary, though it generally discharges into Hutton Lake.

In the drainage area of Sand Creek are situated the Hutton and Creighton Lakes, which lakes tend to diminish the amount of water reaching the river and their evaporation and their losses are supplied from water from Sand Creek and other sources, which waters formerly reached the Laramie river. These lakes have not been used heretofore for irrigation and the waters flowing into them are practically wasted. With the exception of Fish Creek, Five Mile and Soldier Creek, scarcely any waters reach the Big Laramie river from the east below Sand Creek, until after it has reached a point below the Wheatland Reservoir.

As the Laramie river passes through the Black Hills, or Laramie Mountains, in its escape from the Laramie Plains, it receives water

from the following creeks from the north: Big Springs, 1393 Dodge Creek, Duck Creek, McFarland, Luman, Dry Laramie, and North Laramie. The latter is one of the principal tributaries and drains the country around Laramie Creek. On the south it receives practically no water while passing through the cañon, but below the mouth of the cañon several important tributaries enter the river of which the more important are: Slater Creek, Sybille, and Chugwater creeks.

From the point where the Laramie river enters the Wheatland reservoir, which is near the northerly terminus of the Laramie Plains, there is little land cultivated or irrigated with the exception of the Wheatland area. Detached areas are found widely separated and are generally irrigated from the tributary streams or springs, and consist principally of bottom meadow lands where native grasses are raised. The area, other than the detached portions mentioned, consists of rough, broken, hilly and mountainous country and high table lands which are not susceptible of irrigation, and whose use is confined almost entirely to the grazing of live stock.

The drainage of the Cache la Poudre river is bounded on the southwest by the Front Range of the Continental Divide, beginning at Mount Richtofen, which is the southerly extremity of the Medicine Bow Range, running thence southerly to Specimen Mountain. The southerly portion of the drainage area consists of a lower range of mountains extending from Specimen mountain to Signal Mountain, which has an elevation of about 11,450 feet. The Green

Mountains and Boulder Ridge form the westerly and north- 1394 westerly boundaries of the drainage areas. The elevation of this mountain range in its southerly extremity reaches 13,000 feet and gradually decreased to the north until at the state line it does not exceed 9,000 feet. The Cache la Poudre river heads in Chambers Lake, which in turn is fed by the waters of Joe Wright Creek and Trap Creek. These enter the lake from the south. Below Chambers Lake, tributaries enter the river from the south above the mouth of the cañon, and the principal ones are: South Fork, Sheep Creek, Bennett Creek and the Little South Fork. The tributaries entering these streams below Chambers Lake from the North are: Tunnel Creek, Roaring Fork, Seven Mile, Elkhorn, Gordon and the North Fork of the Poudre. The Cache la Poudre river at the gauging station above Fort Collins has a drainage area of 1060 square miles. The North Fork of the Cache la Poudre has a drainage area of 550 square miles. The Cache la Poudre river proper after leaving the highest portions of its drainage area flows in an almost due easterly direction, while the Laramie river flows in an almost northerly direction, or at right angles to the Poudre river.

The course of the Cache la Poudre river is at right angles to the general trend of the mountain range. It leaves the mountains just above Fort Collins. From thence it flows through a plains country and has a considerable fall to the east. It is a tributary of the

1395 South Platte river, which in turn is a tributary of the Platte river. The North Platte river and the South Platte river join at the town of North Platte in the state of Nebraska, to form the Platte



river, which, in turn, flows into the Missouri, then to the Mississippi, and then on to the Gulf of Mexico. The town of Greeley, Colorado, is near the junction of the Poudre and the South Platte. From Chambers Lake to the point where the river leaves the mountains, it flows in a narrow mountain valley, or generally a cañon.

At the point where the Greeley-Poudre Irrigation District has constructed its tunnel for the purpose of bringing the waters of the Laramie river over into the Valley of the Cache la Poudre, the two rivers are separated by the Green Mountains. The distance between the two rivers being about two and one-quarter miles. From this point the rivers flow at right angles never again approaching. Nor do their tributaries approach. So that it is impossible, or rather impracticable, to build any tunnel at a point lower on the streams.

Surveys have also demonstrated that it is impracticable to take water from the Laramie river at any point lower than the intake or tunnel and conduct it into the Cache la Poudre drainage. The system of the Greeley-Poudre Irrigation District represents, therefore, the final development of the waters of the Laramie river for the lands in the State of Colorado, other than the small areas along the Big Laramie river and its tributaries.

It is of interest at this point, that water is now and for many years past has been diverted from the Pacific slope to the Atlantic slope and used on the Great Plains. This diversion is commonly  
1396 known as the Grand River Ditch as it carries water from the Grand river and its tributaries to those of the Cache la Poudre.

Similarly water has been for many years diverted from the headwaters of the Laramie river through the Sky Line Canal and stored in Chambers Lake, discharged thence into the headwaters of the Cache la Poudre and used in the Cache la Poudre Valley for purposes of irrigation. These two diversions are made by The Water Supply and Storage Company, which diverts these waters from the Cache la Poudre river in the vicinity of the town of Fort Collins and irrigates land on the north side of the river and adjacent to the southwesterly portion of the Greeley-Poudre district. This land lies immediately adjacent to the Greeley-Poudre Irrigation District. This system, now known as the Water Supply & Storage Company system, was formerly called the Larimer County Ditch System. The system of the Greeley-Poudre District also diverts water from the Laramie river drainage into the Cache la Poudre drainage for the purpose of irrigating lands on the Great Plains to the north and east of the town of Greeley. It is intended to so divert the water.

The diversion works on the Laramie River are at a considerable less elevation than the Sky Line Canal. I refer to the diversion works of the Greeley-Poudre system. These works are at a point where the west fork and east fork of the Laramie river join, both of which forks are intersected by the Sky Line Canal, and with their tributaries, furnish the entire supply of the Sky Line canal. These streams tapped by the collecting ditches of the Greeley-Poudre District are none of them very large. McIntyre Creek, the largest of the tributaries, is tapped about one mile below the crest of the divide and the drainage area is less than 2 square miles, so

that the collecting ditches can only secure such supply as is furnished by those 2 square miles. Rawah and Spring creeks have a drainage area of about 11.3 square miles, Rapid creek  $3\frac{1}{2}$ , Fall Creek  $1\frac{1}{2}$  square miles, Mill Creek 2 square miles, and West Fork of the Laramie  $1\frac{1}{2}$  square miles; these areas being exclusive of that tapped by the Sky Line Canal, a total drainage area intercepted by the collecting ditches of 24 square miles. The east fork of the Laramie River, exclusive of that tapped by the Sky Line Canal has a drainage area of about 5 square miles. Other streams from the east and intercepted by the east side collecting canal are Half Mile, the drainage area is  $2\frac{1}{2}$  square miles; Springer Creek,  $4\frac{1}{2}$  square miles, Brinker Creek 2 square miles, Porter 2 square miles, Nunn Creek 12 square miles, Deadman Creek (exclusive of that tapped by the Wilson Ditch) 11 square miles, a total of 39 square miles and a total for both sides of the valley of 63.5 square miles exclusive of the territory tapped by the Sky Line and Wilson diversions.

The Wilson Creek Diversion is a trans-mountain diversion similar to the Sky Line and Grand River ditches. Its collecting ditches, which intercept the waters of Deadman Creek, carry the water into Sand Creek, it flows down this Creek for a short distance and is diverted into a tributary of the Cache la Poudre river, known as Sheep Creek; it flows down Sheep Creek and is diverted later from the Cache la Poudre river by the Eaton ditch and others.

This Wilson ditch which I mention is near the top of the divide between the Laramie river and the Cache la Poudre river. I might say that the Sky Line drains an area of about 15 square miles. It has been variously estimated at from 10 to 20 square miles, and I am not able to say which is the truer figure, there seems to be so much discrepancy in the maps which are available. The Wilson ditch is not a very large diversion, although it is capable of diverting as much, possibly a little more than 200 cubic feet per second. I should state here that some of the water originating on that portion of the drainage area above the Sky Line and the Wilson ditches reaches the Laramie River. There is a certain amount of seepage from the ditches, and at certain periods of the year the water is not diverted, and some of the water gradually forms springs. By deriving water from territory above the ditches, it forms springs below the ditches. There is a gauging station at Glendevay, which is several miles below the entrance to the Greeley-Poudre tunnel. It has a drainage area of about 102 square miles.

1399 Deadman Creek and its tributary, Nunn Creek, enter the Laramie River at Glendevay. I am now having compiled the record of the discharge of this station. These are not quite complete at present but the discharge at this gauging station appears to be from sixty-five to seventy thousand acre feet per annum, exclusive of the water which has been diverted by the Sky Line and Wilson ditches. In my judgment, about one-fourth of this water enters the river below the tunnel entrance and comes from the territory below the collecting ditches. The result being probably about

only 75 per cent of the water shown at the Glendevy station is available for diversion at the Greeley-Poudre tunnel.

Glendevy is about fourteen miles south of the state line, by an air line. The distance by meander of the stream would be considerably greater. I wish to say at this point that at a later date other witnesses, and perhaps myself, will present in detail such matters as the drainage area, run-off, water supply and related subjects, also a more minute description of the Greeley-Poudre system. It is well at this time, however, I think, to give a brief description of this system if I can find my notes.

Before taking up a description of the Greeley-Poudre system, I wish to state that by an extension of the west collecting ditch of that system in a northerly direction, it can tap the McIntyre 1400 creek at a lower elevation than it is tapped at present. The extent of the territory which would be tapped by such an extension being approximately 36 square miles.

I do not intend to state that a further diversion other than the tunnel, could be made from the Laramie. The Water would necessarily run down hill from the point where it would tap the McIntyre southerly to the entrance of the tunnel.

As previously stated, the Greeley-Poudre system consists primarily of diversion water from the Laramie river drainage and that of the Cache la Poudre. In order to obtain as much water as possible, collecting ditches, so-called, have been constructed along the slopes of both the Medicine Bow and Green Mountains. The canal of the Medicine Bow slope, called the West Side Canal, taps the stream headwaters of McIntyre Creek, intercepts Rawah Creek well towards its mouth and also West Springer, Rapid, Fall and Mill creeks near their mouths, and flowing southerly terminates near the Greeley-Poudre tunnel. The canal on the Green Mountain slope known as the East Side Canal, begins by tapping the waters of Deadman Creek within about a half mile of its mouth; it intercepts Nunn Creek, Porter Creek, Springer Creek, Half Mile Creek, flowing south also to the mouth of the tunnel where its waters join the waters from the West Side Canal and from the West and East Forks of the Laramie River.

These ditches are technically known as collecting ditches, as they collect the water flowing down from the mountain sides and 1401 carry them to a common point which in the present case is the westerly portal of the tunnel. These two ditches, in fact, carry the water along the side of the ranges forming the walls of the Laramie Valley, and in effect take it upstream with reference to the flow of the Laramie river.

The tunnel has been driven through the Green Mountain Ridge for a distance of two and a quarter miles and discharges the water into the Cache la Poudre river, from thence, it flows down that stream to one or more reservoir sites located in the Cache la Poudre river channel, provided or to be provided for its storage. After having been stored in the river reservoirs, the water will be again discharged into the river and flow to the headgates of the Greeley-Poudre Irrigation District Canal, which canal heads just inside

the mouth of the canon of the Cache la Poudre. The water after being taken into this canal is carried to the lands of the Greeley-Poudre Irrigation District and to numerous reservoirs under the canal, where it will be again stored and conserved for future use when not needed for immediate use.

By means of this system of tunnel, canals and reservoirs, the water diverted in part during the non-irrigating season will be reserved for use when needed and will supplement the supply received from the Cache la Poudre river when the floods of that stream are insufficient to furnish the priorities of the district with water.

Without this supplemental supply the flood waters would be of practically no use to the district or to any other development, for the reason that the structures necessary for its conservation would necessarily be of such cost and magnitude as to make it prohibitive, considering the then necessarily limited amount of land that would be served. These floods would be difficult of conservation for the further reason that after the normal flow and the smaller floods are used and diverted, the remaining large floods are uncertain, variable and erratic in character. It is only during abnormally large supply of water that the district can claim water from the Cache la Poudre river. The matter of the cost and expenditures of the District will be given later by another witness.

In the development of the agricultural resources of Colorado, as has been stated by numerous writers upon the subject, the first efforts were individual and the lands reclaimed were almost exclusively the bottom lands immediately adjacent to the streams. Colorado, east of the Continental Divide, was particularly fortunate in having streams with a rapid fall which enabled the builders to divert water without very great expense, and it was also fortunate in the almost unlimited acreage of fine prairie land.

The original incentive to agriculture in Colorado was to furnish hay, grain and other farm products to the mining districts, which prior to the discovery of silver at Leadville, were principally the mines at the head of Boulder and Clear Creeks. The ore was transported by means of teams, as was also the lumber and all other products of the mountain districts. This required a large amount of feed for horses, and it was to supply this need that the bottom lands were taken up and the hay irrigated and cut. The growing of oats naturally accompanied the growing of hay, and later wheat was grown to furnish the flouring mills which were built at several points in the farming districts, the first being probably at Littleton, above Denver, known as the Rough and Ready Mill, which was built about the year 1860. Another flouring mill was  
1403 built on Boulder Creek, the grist mill on that creek was built in 1861, and the flouring mill in 1866.

After the individual effort at building ditches had practically exhausted the very easy developments, associations of individuals or communities banded together to build larger and more extensive canals. Typical of this development are the canals built in and

around the town of Greeley by the Greeley colonists. These canals are known as Union Colony No. 2 and Union Colony No. 3.

Succeeding the community enterprise, and beginning with about the year 1878, incorporated companies were formed which secured a large part of the necessary funds for the construction of irrigation systems from outside of the state. Typical of this development was that of the Northern Colorado Irrigation Company which constructed the Loveland Lake and the Loveland-Greeley Canal, now known as the Greeley and Loveland Canal, and the High Line Canal in the vicinity of Denver. The corporate enterprises flourished until about 1893, when the panic of that year stopped nearly all of the irrigation development.

During the latter part of the 80's and the early 90's a shortage of water for the late crops, such as potatoes, cabbage, beets, etc., occasioned the construction of numerous storage reservoirs for the conservation of winter flow and of the flood waters. The builders of these reservoirs were companies made up largely of farmers using such waters under already constructed ditches. By these reservoirs, most of the available remaining water in the Cache la Poudre and other valleys, was appropriated and applied to a beneficial use.

About this time, also, the so-called Carey Act was passed, which contemplated the reclamation of the arid lands by the states. Generally, however, under this Act, the states have delegated the construction to corporations.

1404 The next step in development was under the National Reclamation Act which was passed in 1902, which Act again centered attention upon irrigation development, and this act is largely responsible for the very rapid growth of irrigation development during the last decade. In the meantime, the District Irrigation Law of California had been passed and tried. Its defects had developed and it was thought that they could be corrected. Accordingly, in 1905, the Colorado District Irrigation Law was passed similar in many respects to the so-called Wright Law of California, and under the provisions of this Act, the greater portion of the development of Colorado has been accomplished since its passage.

These excessive methods of development indicate clearly the constantly increasing cost of development and they made possible the overcoming of physical difficulties which neither the individual nor the community enterprises could cope with. The most difficult and expensive development undertaken is probably in the class of trans-mountain diversions. Here it is necessary to build canals in regions remote from labor and materials, markets, through comparatively unoccupied territory and over lines where a large part of the work is through rock and along steep hillsides, where the seasons suitable for construction of canals are short and labor hard to obtain, where the most substantial construction is necessary, and where the utmost care must be exercised in the selection of the route and in the performance of the work. The ice and snow conditions of winter must be provided for and guarded against and tunnels of greater or less extent are generally necessary.

The Greeley-Poudre District has about 20 miles of collecting

1405 canals along steep hillsides, largely in rock, and the construction of the Greeley-Poudre tunnel two and one-quarter miles in length, required the transportation of labor and materials by men and teams for a distance of about 78 miles from Laramie, Tie Siding or Fort Collins, and it was an engineering feat worthy of the attention of the best engineering talent and required the expenditure of a large amount of money and time. While the time consumed in the actual construction of the tunnel is not great, its location and necessary preliminary examination of almost the entire mountain ridge to determine the probable water supply and the raising of capital, necessarily consumed a number of years.

The shortage of water in the Cache la Poudre began to be felt in the early 80's. Chambers Lake Reservoir was built in 1882, and the Sky Line Canal in 1891. As the cost of development increased, economy of water was forced upon the users, so that today in the valley of the Cache la Poudre we have probably the highest duty of water in the inter-mountain region; but notwithstanding this, additional lands are being brought under cultivation and the prediction, that a still higher efficiency in the use of water will be attained, is justified. It appears here, as elsewhere, that only through necessity can the economical use be enforced.

To date, there has been no necessity for the economical use of water from the Laramie river, especially on the Laramie Plains. As a result, one should not be surprised to discover that the methods of use and application of water on the Laramie river are, generally speaking, crude, inadequate and poorly managed. Contrasted with the extensive development upon the Greeley-Poudre Irrigation District are the more recent developments upon the Laramie Plains and at Wheatland. We find on both the Laramie and 1406 the Little Laramie rivers an almost innumerable number of small irrigation ditches, poorly located and constructed, and without substantial headgates, dams or controlling devices. A small pile of rock and brush and unhewn log cribs are typical of the dams in the river. Until recently even the Pioneer Canal, one of the largest in the District, and the Oasis, were not adequately provided with means of diverting the water. A very recent construction, the best in point of efficiency, permanence of construction, adequacy of capacity and facility of operation is the system of the Laramie Water Company.

The development of this system was comparatively inexpensive. The Company's reservoir, Lake Hattie, was a natural basin requiring a rather low dam of moderate length. The inlet canals from both the Big and Little Laramie rivers were comparatively short and inexpensive. The outlet canals and the laterals were across the prairie where little rock or difficult construction was encountered. In fact, the system is singularly free from flumes or other expensive structures. Furthermore, the system is such that work could be carried on on all of its several parts simultaneously, so that neither a very great expenditure of money, or of time was necessary.

The earlier development of the Wheatland area involved more engineering skill and a greater length of time in the laying out of



the general plans. The construction of a rock fill, timber crib dam in the Laramie river was necessary to divert water into the tunnel connecting the Laramie river with the Blue Grass. This tunnel, however, is only about  $3/5$  of a mile in length, and the water after passing through the tunnel, flowed down the Blue Grass creek 1407 some 14 miles into the Sybille, and down the Sybille for a half mile into headgate No. 1 six miles further to Canal No. 3, and five miles further to Canal No. 2.

The upper portions of the canals are along hillsides and encounter some shale rock, but the remaining portions are of comparatively easy construction and are free from any expensive structure.

On the Wheatland tract, there is one reservoir of considerable size, said to contain about 7,000 acre feet, into which any surplus water which may have been transmitted through the tunnel may be stored for future use. After the system described had been constructed for the Wheatland area, and after considerable land had been put into cultivation, the water users found themselves somewhat short of water during the low flow of the river, and during the latter part of the irrigation season. This necessitated the construction of the Wheatland Reservoir, which is located near the northerly extremity of the Laramie Plains, in a natural depression, adjacent to the river. It is just above the canon, where the Laramie river breaks through the Black Hills.

The reservoir is credited with a capacity of 126,000 acre feet. The dam itself is only about 35 feet in height, and is of moderate length. No great expense of riprapping was necessary, and, as shown by the evidence heretofore adduced, the cost was very moderate.

The reservoirs constructed on the Laramie Plains, are also remarkable for the cheapness of their construction. The Wheatland Reservoir, James Lake, and Lake Hattie do not average in cost per acre foot more than one dollar. The Pathfinder reservoir, with which the witness was connected for several years, was the cheapest 1408 in his experience. The cost of this reservoir was \$1.50 per acre foot, while the Terrace Reservoir, with which he was also connected, cost \$20.00 per acre foot. The Halligan Reservoir in the North Fork of the Cache la Poudre river, cost about \$32.00 per acre foot, while Lake Cheesman cost about \$20.00 per acre foot.

These three reservoirs are considerably larger than the average reservoirs in northern Colorado. The Wheatland Reservoir, Hattie Lake and James Lake would be considered very large reservoirs in northern Colorado. I might say the construction of reservoirs in Colorado at present which have a cost per acre foot as low as \$10.00, are considered very cheap reservoirs and very desirable ones at that.

The drainage area of the Big Laramie river at Boswell's ranch, which is at the point where the Laramie river crosses the Colorado-Wyoming line, is about 365 square miles, all in Colorado. The greater part of this drainage area is high mountainous country, furnishing a considerable run-off per square mile. The balance, the Sand Creek county, 81 square miles in Colorado, is mostly rough, broken mountains and hilly country. The valley of the Laramie itself should be classed as mountainous territory. In Wyoming, the

mountains to the west of the Laramie Plains, contributing water to the Laramie river, between the Colorado-Wyoming line, and the Little Laramie river, covers about 84 square miles. This territory also furnishes a good supply of water. The mountain and hill country at the northern end of the drainage basin of the Laramie river,

including that which contributes to both the Big Laramie 1409 and the North Laramie rivers comprises some 17 townships and a portion of the Black Hills, which contribute to the Laramie drainage in the Laramie Plains about 180 square miles.

In the Laramie Plains, exclusive of the areas mentioned, are 132 square miles, and in that portion of the drainage area is the Black Hills, comprising the watersheds of the Blue Grass, Sybille, Chugwater, etc., are 1476 square miles. From this latter area, there is considerable run-off as shown by the records of the flow of the Sybille, and the Chugwater. These two streams furnish water for the lands along their border, and discharge some water into the Laramie river, after the needs of the farms and ranches have been supplied. The Laramie Plains area, outside of the mountains furnishes little water, as does also that portion of the Black Hills which drains into the Laramie Plains.

The drainage area of the Little Laramie river above the gauging station at Filmore, on that stream, is about 155 square miles.

The discharge of the Big Laramie from an area of 365 square miles, is about 250,000 acre feet per annum. That is inclusive of the diversion made by the Sky Line and Wilson ditches. The Sand Creek Drainage in Colorado is about 81 square miles, and I estimate there is about 10,000 acre feet. The Little Laramie River furnishes about 150,000 acre feet at the Filmore Gauging Station. Other

streams flowing from the west, from 85 square miles, are 1410 estimated at 70,000 acre feet. From the Laramie Plains area itself the run-off is estimated at .05 of a foot in depth over the entire drainage area, or from 1560 square miles, 48,000 acre feet per annum, making a total of 528,000 acre foot tributary to the streams above the Wheatland Reservoir. The discharge on the North Laramie is very largely consumed in irrigating land along that stream, as are also the waters of the Chugwater and other streams, so that these areas need not be considered at this time.

Near the Wheatland District are two other irrigation districts, of very recent construction, called the Bordeaux and the Sybille Districts. The canal has been constructed for the Bordeaux tract but very little land has been cultivated or has had water used upon it. The land in this district in general appearance is quite rough, consisting probably originally of mesa land of moderate height, though the waters in the course of time have erroded innumerable draws, gulches, canons and arroyos, so that the irrigable lands today consist of mere strips of these arroyos and segregated tracts on the top of the original mesa.

The Sybille tract which lies to the west of the Wheatland Tract and at a somewhat higher elevation than the Wheatland Tract has a mesa divided into two portions surrounded and separated from each other by high hills. A considerable portion of this land is irrigable.

The main canal is in part constructed, but no water has as yet been applied to the land.

The development of these two tracts appears to have been an after-thought on the part of the projectors of the Wheatland Colony, with the belief that with the Wheatland Reservoir there was  
1411 an ample supply of water not only for the Wheatland Tract but also for these two tracts.

The unfinished condition of these two projects, the absence of settlement anticipating the availability of water, seems to indicate that it will be a very considerable time before these two tracts are settled. The lack of settlement under the Laramie Water Company's project, notwithstanding the completion of its reservoirs and ditches, also seems to indicate that settlement will be slow, as it has been in the past.

On the Talmadge-Bunton Project, being the land supplied from Lake James and that system of ditches, there has been some settlement, but most of the settlers after building their houses, plowing the ground and fencing, have deserted it, so that there are today fewer people than there were a few years ago. To the observer this indicates that the conditions at present are such that farming operations are not justifiable in the Laramie Plains and that the only justification of what settlement there is on the Laramie Plains today is the fact that a certain amount of supplemental farming operations are necessary to properly conduct the live stock industries. In fact the Laramie Plains have been, since the first settlement, a livestock district devoted principally to breeding purposes and summer range rather than the production of the finished product.

The tract of land known as the Laramie Plains is bounded on the north by a rough and broken mountain country, which is the north-westerly continuation of the Laramie or Black Mountains. It is bounded on the northwest by the divide between the Little Medicine Bow river and the Laramie river; on the west by the Medicine Bow mountains or rather, by their easterly outposts, the Centennial Mountains, Sheep Mountain and Helm Mountain; to the south, the valley is bounded by Boulder Ridge and to the east by the Black mountains. It has a length in Wyoming of about  
1412 60 miles and a width exclusive of the mountain parks at the head of the Little Laramie river, of perhaps 25 miles. Viewed from a distance, this tract appears to be a vast level plain, but on closer inspection it is found to be a rolling country and covered with a growth of short native grasses. The absence of trees from the entire area of the plains is remarkable.

Along the Laramie river above the town of Laramie there are groves of cottonwoods, but below Laramie, even these trees are almost entirely absent. Along the Little Laramie river outside of the foot hills, also, there are no trees except occasionally a few scrub cottonwoods. In the late spring and early summer the impression is favorable and the possibilities of grazing cattle and sheep appeal to one; and were it not for the almost continuous cold winds that sweep the plains with considerable velocity throughout the year,

the general impression would be quite favorable at this time of the year.

To one unaccustomed to the country, the sparseness of settlement, the great distances between the ranch houses, the scarcity of grazing cattle or sheep, the few travellers met upon the road, the apparent newness and barrenness of the view is discouraging, especially when it is considered that this district has enjoyed railroad facilities longer than almost any other portion of the inter-mountain region. It should also be borne in mind that through these plains some of the great highways were used even before the advent of the railroad, and that the Laramie river country was at that time as well known as

any district of the west, and that along the banks and on the headwaters of the Laramie river the early trapper and hunter

1413 found great quantities of fur-bearing animals. The traveler further observes that many of the ranch houses have been deserted, that there is apparently on the part of those living there at present, other than with the elder stock ranchers, no effort to make a comfortable, pleasant and permanent home. The absence of trees, of lawns, of yards, of those things which go to make a pleasant home for the women folks, lead the observer to believe that even those people who reside there at present are there only temporarily and are living only with the hope of leaving.

When he observes the new irrigation projects, he wonders whether the projectors have been competently advised, and whether it is not spoiling a good ranch country to make a poor farming country, which is destined ultimately to failure.

This impression I received when I first went in there and it has been borne in upon me ever since; every time I go up there.

In the valley of the Cache la Poudre, on the other hand, one is surprised with the development, though as compared with the Laramie Plains its railroad facilities have been of more recent development and its history newer. The whole valley of the Cache la Poudre is dotted with reservoirs where the natural topography of the country has been taken advantage of, and in which almost the entire available water supply can be conserved. While on the Laramie Plains, though enjoying more and cheaper natural advantages for reservoir building, there are only a few reservoirs, and these of recent construction. The natural basins in the Laramie Plains at present used principally as a dumping ground for the surplus waters from the irrigation canals where the waters waste by evaporation, or other depressions are alkali lakes which have remained undrained or are wet seepage lands which have remained unreclaimed.

1414 In the valley of the Cache la Poudre there are 65 decreed ditches, which served in 1911 more than 248,480 acres, and were capable of serving 376,750 acres if there had been a sufficient water supply. The valley of the Cache la Poudre under the ditches outside of the foothills, is about 35 miles in length, runs in a north-westerly and southeasterly direction, and has an average width in excess of 12 miles exclusive of the Greeley-Poudre Irrigation District. Outside of the Cache la Poudre valley proper, is a very considerable territory lying north and east of the town of Greeley, and also lying

in the watershed of the Big Thompson and South Platte rivers, which are irrigated from ditches deriving their supply from the Cache la Poudre river.

Broadly speaking, probably more than eighty per cent of the land under the ditches is in actual cultivation and on which the more valuable crops such as sugar beets, potatoes, grain, garden truck, etc., are raised. Alfalfa, of course, comprises the greatest acreage of any one crop. In 1913, it was reported by the Water Commissioner, who was required to make such report, that some 54,000 acres lying in the Cache la Poudre valley were in alfalfa; that there were only 7028 acres in natural grasses, nearly 85,000 acres in cereals; 2370 acres in orchard; 1574 acres in market gardens; 30,410 acres in potatoes, 38,450 acres in sugar beets; and nearly 6,000 acres in other crops. The 7028 acres reported in natural grass are those which are under irrigation.

These acreages as reported by the Commissioner, represent only a portion of the land in cultivation under the ditches and do not represent all of the land cultivated, especially it does not show the acreage under the dry farming operations. Furthermore, it only represents that part on which the Commissioner reports, and 1415 where the acreage is probably considerably greater than given.

The valley of the Cache la Poudre is recognized as the most advanced agricultural district in the inter-mountain region. It has reached a higher stage in the growing of crops and in the utilization and conservation of its water supply.

The average discharge of the river at the mouth of the river is about 322,000 acre feet, which is less than one acre foot per acre for the 375,750 acres under ditch. This, of course does not represent the total water supply, as there are a few tributaries bringing water into the district below the gauging station where the measurements were taken. Further, this supply does not show the return and seepage waters which are used and re-used, but it does show that less than one acre foot of water as measured at the canon's mouth will be used and re-used to serve an acre of land. The total amount diverted by ditches as reported by the Water Commissioner in 1912, was 419,368 acre feet, of which about 100,000 acre feet was carried over and used in the dry season of 1913. The Water Commissioner also shows that for 1911, 233,653 acre feet were all that was diverted.

On the same basis, and assuming that there were 400,000 acre feet in the region south of the Laramie river and its tributaries that were properly conserved and economically used, that would be sufficient water to irrigate 400,000 acres of land on the Laramie Plains and from the Laramie river.

The Wheatland area is quite different from the Laramie Plains proper. Here the country is better protected, it is more than 2000 feet lower, and although comparatively a new settlement, it has the appearance of permanence and prosperity, especially on the portion of the project which is in cultivation and amounting—according to testimony previously given in this case—to 35,000 acres. The

1416 farm buildings on the Wheatland area are more permanent, comfortable, substantial and are generally surrounded with trees, and though the growing season on the Wheatland area is shorter, on account of its altitude, than the growing season on the Cache la Poudre, it has many characteristics in common with that valley.

The general appearance of the Wheatland area is the same as the Cache la Poudre Valley presented in the middle 80's about the year 1885; while the customs, habits, industries, and especially the methods of irrigation on the Laramie Plains, are about such as were found in northern Colorado between the years 1870 and 1880, which methods still obtain in some degree in those parts of Colorado where there is still an abundance of water.

There is but one town on the Laramie Plains, the town of Laramie, which, according to the last census had a population of 8337. There is but one town in the Wheatland District, the town of Wheatland, accredited by the census with 400. On the Cache la Poudre there is Fort Collins, which by the census had 8210 population; Timnath, 175; Windsor, 935; Severance, 150; Greeley, 8179. These towns are adjacent to the river itself, while in the valley are Eaton with 1157 inside of the corporate limits and 2000 in the city and immediate vicinity; Wellington, 459; Evans, 500; Lucerne, 100; Ault, 569; and Pierce, 175 people.

DENVER, Dec. 16, 1913.

JOHN E. FIELD, recalled.

Examination by Mr. Fred Farrar:

None of the towns in either the Laramie Valley or Poudre Valley would be considered as commercial centers, other than supplying the needs in their almost immediate vicinity, tributary almost exclusively to them.

The difference between Laramie and the towns in the Cache la Poudre valley is that the towns in the Cache la Poudre valley are agricultural towns. They are dependent almost exclusively on the trade which they have with the farmers. They supply the farmers with whatever they need, of course, and also help the farmer in the disposition of his products. They are, you might say, strictly farming communities, while the town of Laramie would be considered, I think, a railroad town. Scarcely any of its support comes from the farming community. That is, the greater part of its support comes probably from the railroad and the presence of the University. The amount of money spent in Laramie, for instance, by the railroad, according to the evidence heretofore ad-  
1418 duced, amounts to several million dollars a year.

There are small factories in the towns in the Poudre Valley, which manufacture some machinery, headgates and steel structure works for ditches and reservoirs. That industry is not very great. The manufacture of sugar, of course, is carried on in most of these towns, and their influence is very considerable; but both of these main manufactures are directly associated with the farming ele-



ment in the vicinity. Sugar factories are located in Ft. Collins, Greeley, Eaton and Windsor. I am under the impression these factories vary from 600 to 1200 tons per day. The 600 ton plant would be a small one, while a 1200 ton plant would be a large plant. The raising of sugar beets constitutes one of the great industries of the Poudre Valley.

Speaking of railroad facilities, at Laramie there is a trans-continental road, the Union Pacific, which crosses the Laramie Plains, and there is also the Laramie, Hahn's Peak and Pacific Railroad. The line of the Union Pacific barely touches the agricultural area of the Laramie Plains until the railroad gets to the town 1419 of Laramie. It passes over little agricultural land after leaving the town of Laramie going west. Immediately after leaving Laramie the road runs north until it reaches the town of Bosler, and it does not cross a very great amount of agricultural land. It crosses the land along the Oasis Ditch. I might say that this road skirts, rather than traverses the irrigable area. The Laramie, Hahn's Peak and Pacific runs on a ridge of practically uncultivated land through its entire length to the west of the town of Laramie. Those are the only two roads with which the town of Laramie is supplied. There are no spurs or feeder lines running into the agricultural districts. The Union Pacific is strictly a trans-continental line. The Laramie, Hahn's Peak and Pacific taps the Little Laramie Valley and brings some of the products of that valley to the Union Pacific Railroad. The original intention was for it to tap North Park in Colorado more particularly. At Wheatland there is one railroad called originally the Cheyenne Northern. It passes through the district which is irrigated. I think it is now a branch of the Colorado & Southern. It has no branch line or feeders.

1420 In the Poudre Valley the main line of the Union Pacific railroad between Denver and Cheyenne crosses through the lower portion of the valley. It passes through the town of Greeley, Eaton, Ault, Pierce and Lucerne. It has also a branch line starting from Denver, running northerly from Denver until it reaches the Poudre Valley, and then going up the Poudre Valley to Fort Collins. There are in the vicinity of Greeley several of what are locally called Beet Roads,—roads for the hauling of produce to the main line and to the sugar factories located in the different towns. One of these feeder systems runs into the Greeley-Poudre Irrigation District. The line starts about a mile south of Lucerne, runs east four or five miles, where it branches. One branch goes north about 13 miles to Hungerford; and one east and northeast about 18 miles to Briggsdale. Briggsdale and Hungerford are in the Greeley-Poudre Irrigation District.

The sugar company has and operates a beet road under the name of the Denver and Great Western Railroad, circling through the irrigated district. It starts at Loveland, on the Big Thompson river, which is the next valley south of the Poudre, runs to Johnston and to Mead. The second branch runs from Loveland to Windsor, which is on the Poudre river, and then northeasterly

to the town of Eaton, where it joins the main line of the Union Pacific Railroad. At Loveland and at Windsor it connects  
1421 with the Colorado & Southern.

At Fort Collins the Colorado & Southern railroad has three main lines. One runs from Fort Collins to Cheyenne; one running from Fort Collins southerly to Denver and one running from Fort Collins southeasterly. The latter branch is practically parallel with the Poudre river the entire distance. There are also branches of this road which are called Beet Roads, one spur running over into Black Hollow, which is about ten miles east of Fort Collins in the most direct line. There is also a branch road running from Fort Collins up the river to Bellvue, Ingleside.

There is one other road in the lower end of the Poudre Valley that I forgot to mention, the Denver, Laramie & Northwestern Railroad, which runs between Denver and Greeley. There is a branch of the Colorado & Southern railroad running from Wellington to Waverly. This branch is about ten miles north of Fort Collins. All of the towns that I have mentioned, with the exception of Loveland, Johnstown and Mead, are in the Poudre valley.

The Poudre Valley is very well supplied with railroad facilities. It is generally desirable in raising beets and potatoes, to be  
1422 within three miles of a railroad. This condition is practically accomplished in the Poudre Valley.

I have prepared a sketch map showing the drainage areas in Colorado and Wyoming and of adjoining territory.

(Sketch map marked defendants' Exhibit 21 and offered in evidence.)

Cross-examination of Mr. Field temporarily waived with the understanding that there would be other detailed testimony by the witness later.

LOUIS G. CARPENTER, Denver, Colorado.

Direct examination by Mr. Delph E. Carpenter:

I am an engineer by profession, a graduate of the State Agricultural College of Michigan, class of 1879, and subsequently  
1423 a student and post graduate at Michigan University and at the Johns Hopkins University at Baltimore. I specialized in connection with irrigation. I have so specialized since I came to Colorado in 1888. I had been interested in it somewhat and for several years before that from the time I first visited Colorado in 1884. In 1884 I came here to act as professor of mathematics and engineering at the Colorado Agricultural College at Fort Collins for a short vacancy during my own vacation, and while here I met various people, farmers, engineers, and the then State Engineer of the state, Mr. Nettleton, whom I visited a number of times while I was in the state. Mr. E. S. Nettleton was at the head of the U. S. irrigation survey that was instituted; but that was prior to the Reclamation Service and prior to the Reclamation act. He was chief engineer of that and in connection with the Department of Agri-

culture, for several years during which that work existed. I came west permanently in 1888 as Professor of Engineering and Physics, at the Colorado Agricultural College, and also had a position in the Experiment Station, a department of the college that was somewhat independent in one way in its funds. The experiment station is maintained by the United States appropriations and for the scientific investigation of questions relating to agriculture.

1424 A course in irrigation engineering was established at the State Agricultural College almost immediately after I came, or about a year later. It was the first in the United States. I was at the head of the department and organized the course of instruction and had charge of it through my connection with the institution. The first class began in 1889 and graduated in 1892.

I did work outside of the school in connection with the experiment station. That brought me in touch with the irrigation work throughout the whole state. The scope of the Experiment Station was not instruction, and the investigation of questions that I took up in connection with it took me around the state a good deal and also some other questions that were brought to me, because the matters were of interest to the United States. For instance, in 1889, I visited a great many canals in the state with superintendents and engineers in the Arkansas and San Luis Valleys and the streams nearly like the Poudre, and spent a good deal of time in the field in that and a good many subsequent years.

I was field agent for Colorado and Wyoming in the artesian well investigation for the United States in 1890, having charge of the

field work in these two states, which were then one state and  
1425 one territory. It was an investigation started and ordered by

Congress and was apparently started with the idea of its bearing on irrigation. It involved a study of the conditions in these two states, especially in relation to subterranean waters. I went over both Colorado and New Mexico and had a great deal of correspondence. The first trip to El Paso, for instance, and the southern part of New Mexico.

In connection with my various duties, I traveled generally over the arid west and foreign countries. Perhaps it might not all be said to be in connection with my duties, but in connection with my duties I wanted to become conversant with the irrigation conditions in the West. Outside of Colorado I visited, in 1891, California and spent some time in the summer in the San Joaquin Valley in the southern part of the State, and some in Nevada and came through Arizona and saw this region for the first time. I first made investigations of irrigation systems in Utah in 1890, for a limited time and have been there two or three times since for short trips.

I spent the summer of 1892 abroad, especially going to see the irrigated regions of southern Europe, designing to go especially to France, Italy and Spain. As it happened, I did not visit the latter because of the fact that cholera was prevalent, and the period that

would be lost at the borders in getting in and out was deter-  
1426 rent, and I went instead to Algeria, largely because some of the government officials of France asked me to do so. I had

special opportunities in all these regions, both because of perhaps several letters, for instance, from the Geological Survey, Secretary of Agriculture, Secretary of the Interior, and Secretary of State. I think I also had one from the President. So that they gave all the facilities they could in Northern Italy. And they took especial pains in putting me in touch with their conditions in France and Algeria, and put their department engineers at my service so far as could be, with special instructions, so that I came in contact with the conditions in northern Italy and in France and Algeria quite thoroughly. That was then extended with the literature I got in touch with there and subsequently had an opportunity to study and keep in touch with.

The French Government had asked me especially to look into some of their methods in Algeria on their dams, and questions of silt management and disposal. Afterwards, the French Government gave me what they call a Decoration, probably on that account; a gold medal. The decoration was Chevalier du Merite Agricole. In 1898 or 1899 I was made irrigation expert of the United

1427 States Department of Agriculture. Subsequent to 1899, in addition to the other positions and duties at the Agricultural College, I became director of the Experiment Station. The Director is the administrative or executive officer of the Experiment Station, having certain duties under the laws of Congress and regulations established by the Department of Agriculture. In accordance with those laws and having general charge of the scientific work and investigations of the Experiment Station. It is a part of the College administration, and yet separate in some respects. There was then the fund from the United States amounting to \$15,000.00 per annum at least, the Hatch Fund so called, for investigation, and a few years later this was doubled by what is called the Adams Fund, which is given for research, rather than for investigation, making a distinction between those two classes. There were various other funds from the United States, somewhat temporary, and also from the State, so that at the time of my withdrawal eleven years later, the income from the funds was in the neighborhood of \$60,000 to \$100,000 per year for the Station and in the neighborhood of forty or fifty people who were giving their entire time, or a portion of their time to the work under that administration.

1428 This work, I might say, was not only carried on at Fort Collins, but was carried on throughout the whole state, certain phases of it, at least, and that of course, had been true of the irrigation work, which had been under my direct charge as head of the Experiment Station, while the whole scientific work was under my general charge whatever its character.

Investigations with regard to return and seepage waters and irrigation were carried on at the institution directly by myself, initiated by me in the Experiment Station, under the United States funds. Among them were considered measurement of stream flow, especially on the Poudre. There had been prior to that time some investigations by the State Engineer, but he dropped them and took them up along I think in 1889 and continued those measurements

up to 1909 and 1910. The seepage measurements were started by me I think in 1889, first on the Poudre river for a distance of about fifty miles and then as funds permitted in later years, they were carried on down the South Platte river in Colorado, either the whole length, or more generally from Greeley at the mouth of the Poudre down to the State line. I also carried them on on the Arkansas river for a distance of 200 of 250 miles for a series of years; also on the Big Thompson, St. Vrain, and nearly all the mountain streams. These were carried on generally annually, sometimes more frequently, and the reason for taking them up was to get the actual conditions which had begun to develop with the spread of irrigation, and which had begun to be noticed; that is, the appearance of water in the stream, and also because the funds then available were small 1429 and that was within our reach financially. The Rio Grande was also taken up in detail and the study of the irrigation system of the Rio Grande. In those general connections, an attempt was made to get a good deal of data collected with regard to the rain fall in the mountains, where at that time there were no observations. I had had quite a system of observers, who started and some of whom persisted who have kept records for twenty or twenty-five years, but many of them fell by the wayside.

One of these stations was maintained at Long's Peak post office on the Big Thompson; started in 1893 and is still continuing. One was at Water Dale, near Arkins, at the outlet of the mountains, started at the same date or a little prior to that time that is still operating. One at Gleneyre on the Laramie was active I think for about 10 years; with the moving away and sale of property by the then owner, that ceased. There was one in North Park near Walden that continued for fifteen or so years and ceased last fall and others in various places running from two to six or eight years, some in the mountains. There were not many people living there in the first place and secondly there were not many interested in that kind of work who had the stick-to-it-iveness necessary.

During these years I spent a good deal of time in the 1430 summers, when there was a vacation of the instructional part of the college, in the field with canal superintendents, with water commissioners, with engineers of canals, and those who know the local conditions, and were acquainted with the conditions of the canals, so that I went over most of the valleys of the State and most of the ditches of the state quite in detail during that time, and many of them repeatedly, and often with their aid carried on observations and made records and got many of them started in keeping records.

During that time I suggested various improvements both in works and in methods of applying water. Naturally the lessons of experience learned or gleaned from the superintendents of the various canals were made available for the officials of other canals. And along that line one year we had a short course, I think it was called, for Water Officers, held at Fort Collins, in which we brought together a great many of the officers of the state, canal superintendents and so on, quite a good many of them, and got their experiences together.

During these years when occasion and opportunity arose, I gave to the irrigation systems of my region the benefit of my travel and studies. It certainly led to a very large correspondence and a very large mass of questions, but whether they were put into operation or not is another matter. In fact, I have some doubt, and in some cases the advice was not always followed, of course. I thought to their detriment. I became state engineer of Colorado in 1903, 1431 to serve one term, which terminated in April, 1905. The duties of that office brought me in even closer connection with all the officials and irrigators throughout the State, as well as those of other states. That position had executive charge of enforcement of the laws of the state, supervision of the development of water, and a host of duties relating to the water laws of the state. It had at that time in addition, the charge of the construction of roads which were provided for by the legislature, and it had the supervision of dams, passing on their plans of construction, and supervision during construction, all of which duties are such as the office has now. And the office has, through its subordinate officers of water commissioners, direct charge of the distribution of water throughout the state, reports of course were received and some of them were inaugurated at that time, attempting to make the system more effective. Water users of the state were inclined to bring their troubles direct to the State Engineer's office, whether they ought to or not. This all extended and perhaps perfected the acquaintance that had been growing for years before. It of course aided in increasing the perfection of detail information with other states. I don't know as it made more than a normal growth, that would come with the interest and years.

While I was state engineer in 1903, the case of Kansas vs. Colorado, in the Supreme Court of the United States, was pending. It was started before that time and I had formerly had some connection with it. As state engineer I had an ex-officio relation to it, at least

I acted as general engineering expert in preparing the case, 1432 as in fact I had before I became state engineer, and on leaving the office of state engineer, I continued my relation with it, and in that case had the direct relation of consulting engineer and expert for the state and carried that relation through to the termination of the case.

I was a member of the Irrigation Commission of the Province of British Columbia. That Commission consisted of the Commissioner of Land, and myself. I was looked upon as the working member.

My duties were rather of a broad character, appointed under the authority of the Provincial Parliament, and with a very broad injunction to investigate the irrigation system of British Columbia and with the purpose, for one thing, of recommending a system of laws in regard to water that should be put in force. This was in 1907 and 1908. The Province of British Columbia, as at many other 1433 places, had had a system of conditions developing without any special set of laws fitting the conditions. They had then found these laws inadequate to suit the conditions with the



greater growth of population and the settlement that was then coming into the Province, and the old system was hampering them very materially, so it was then to find and recommend what laws should be put in force, and to determine the principles. Of course, that led to a study of the conditions as they were, before recommending any laws. The Commission had power to hold sessions, to take testimony under oath, and practically had quite a wide latitude. The Commission was sworn in under General Laws and then went over all the irrigated sections of the Province and looked very thoroughly into the old records from the time of the first settlement of the Province in 1843, and of such cities as Kanloopa, and so made a very complete canvass of the situation as it then was in order to intelligently build on that with a new set of laws. Such a law was then passed in the next session of Parliament.

I recommended a general foundation for and had something to do with the preparing of the Code. I could not say I prepared it, but I assisted in preparing it. The general principles I recommended in quite a number of specific things, and then the carrying out and putting them in form of a statute was largely due to the other member of the Commission. My duties terminated in 1908.

I was called as an expert in the litigation known as the Colorado Springs Electric and Power litigation. I was first appointed as a joint arbitrator selected by the two parties in the controversy. I had been consulting engineer for the city and also for the other interests in their other matters and when the dispute arose as to interpreting the contracts affecting both of them, they united in asking me to serve as a joint arbitrator. In addition to that each party selected one independently, so there was a Board of Arbitration of three, of which I was the chairman, to determine the conditions that were in dispute. There was some involved questions of the applications of science to electric lighting, especially, which was the province of the Board of Arbitration, in connection with that, testimony was taken from a large body of experts from all over the United States, probably as large a body of electrical experts as ever met together, and that case, I think, has since been the leading case as settling that class of controversies.

In the case of the United States vs. Rio Grande Dam Co., I was notified to take part in that case by both sides of that controversy, that is, the United States on one side and the Elephant Butte on the other, and took part so far as it could be considered personally, in representing the Elephant Butte People, for I thought justice was on their side, and was present throughout that case. That was a case involving directly some interstate matters, and also indirectly.

1435. The international matters involved were the rights of certain Mexican appropriators. Those were involved in a way but not directly asserted. It involved the right to divert water from the Rio Grande river, and there had been some fear by certain interests in El Paso, that it might interfere with matters in Mexico, that is, they took more than a friendly interest in the situation in Mexico, while nominally their interests were over in El Paso.

I resigned as director at the Agricultural College at Fort Collins in June, 1909, and when I ceased my connection in other capacities in December, I had an office in Denver, as consulting engineer, and since that time I have given nearly all of my time here with headquarters here since 1910. I had aids, and conditions and duties called for visits and surveys in different states, from Texas to Washington, Kansas, Nebraska, Idaho and Montana. I have devoted my entire time to that line of work since 1910. Between 1889 and 1910, practically all of my time was devoted to irrigation matters. Instruction that I was giving was primarily along irrigation lines. The investigations were almost entirely along irrigation lines, as was also the instruction lines, so it would not be very far from the truth to say that all my 1436 time was given to irrigation matters. During the years since 1889, I have kept advised as to irrigation developments on both hemispheres. My interest has been along those lines so that I have kept an eye open to all sources of information that were available. I have not made a trip abroad except the one mentioned in 1892, but I have had an extensive correspondence and exchange with many of these countries, have had visits from officials and engineers from a great many of them and have had many of their official publications as well as the reports that were available in other ways.

I was asked by the Cities of Pueblo, Canon City and Salida, to investigate conditions some years since to see whether there was any remedy which might be adopted which would clear up the river which was much polluted by hydraulic mining, and made a report to them of the conditions. Later on they began suit to enjoin the waste or debris by hydraulic mining into that river, and after a suit of considerable length, it resulted in the issuance of such an injunction, and since then the river has gone back to its original condition as a fine stream suitable for fish and domestic 1437 water. During the years of my private practice, as well as prior to that time, I have been called generally throughout the west as an expert on preliminary examinations for irrigation and municipal supply works for the object of ascertaining and reporting both on the character of the works and the water supply.

The investigations made in my private practice have included such as would be customary in asking engineering reports, especially for people who are considering the advisability of making investments and those of questions of water supply, and questions of affording a supplemental supply, of values of land, character of lands, their relation to markets, and, to some extent the questions of administration, but in general all of those things that might have a bearing upon the enterprise or its probable success. The conflict of other rights to water or other users and meeting the troubles that might arise have been considered. There is frequently these investigations have included the consideration 1438 of existing priorities and questions of irrigation law.

I have kept in touch with the irrigation world through various publications and documentary evidence and correspondence.

I read French. I have a large French library both on irrigation and other matters. I read Spanish, Portuguese, German, Italian, so that I have really a great many Italian and Spanish works and French works relating to irrigation. I have a number of Portuguese, but not so many in German.

Starting with the earlier development of irrigation in the arid west and bringing it down to recent times, the irrigation development follows a general plan. From the necessities of the case it follows a general order of procedure. That is true in almost all of the valleys. I have had occasion to investigate the history of a great many and find that they rather classify themselves in such order of procedure. The first irrigation is a sporadic one, a few individuals, consisting of one family or half a dozen families settle and take up land. It is natural for them to take the water the easiest way possible. They naturally select the lands along the river bottoms, in the valleys near the streams, and they obtain water by a short ditch. They then take the smaller streams, not the

1439 large ones because the large ones require expensive construction to divert water, while the small streams are easily managed and require a very short ditch because the fall is great. Then as other people come in, it becomes necessary to build longer ditches. Instead of an individual ditch, they build what may be a cooperative or company ditch. In fact most irrigation companies are cooperative companies, though organized in the forms of corporations. Those may be and are longer and accordingly irrigate land further from the stream so there are, as it were, three or four layers of ditches paralleling each other, but going out further and further from the stream, and in course of time they are apt to call upon all the supply of the stream, at least part of the year. In this country in July and August they are apt to be short. Then they change the character of the agriculture from grain to crops like potatoes, sugar beets and others that require water later in the season and are more profitable; then if they have a shortage of water for a period of the year, that means pressure upon them and the returns are such that they can afford to build ditches and hunt for water. How that need is supplied depends on local conditions. It may result in the building of still longer ditches, getting water at a greater distance; it may result in the building of reservoirs which store the water for a portion of the season from the time when it is plentiful to a time when it is scanty, and naturally it is a step of the same kind to go across to a neighboring stream, if there be a neighboring stream, which will supply water available to supplement their own. There are some changes that arise in administration, like association of ditches and cooperation which are also apt to follow

1440 as in the Poudre Valley. Waste of water decreases both by general economy, general increase in skill and in better preparation of the land so that the land is smooth and the waste water from the roughness is decreased and almost entirely prevented. It may also be by catching tail water which a ditch necessarily loses more or less. That is the general experience. It also comes from the filling in of the sub-soil so that the land does not

require so much water. In such cases very frequently a man does not require one-third as much water as he did in the beginning and even less than that. A great deal of the saving of water comes from the smoothing of the land. The amount of water called for frequently depends not so much on the need of the plant as it does upon the physical condition of the distribution.

The construction of reservoirs is usually not the first step. It generally comes in late and the construction of running water across the divide sometimes comes in somewhat early. It is simply a case of which is the easiest way of getting the water and that depends upon the physical conditions. I know of places where water has come across the divide almost the very first thing 1441 in a community. The same cause which prompts the construction of the cheaper works prompts the construction of the more expensive ones. It is the need for water for the growing of crops. It is rendered possible by the fact that the lands and crops are more valuable so that they can afford to enter upon such construction. It is purely a question in this case of the cost, so that an enterprise which was not feasible thirty years ago would be feasible ten years ago, and an enterprise not feasible ten years ago would be considered feasible today, and enterprises that are not justifiable at the present time will be taken up and built in the course of the next twenty, thirty or forty years.

The development of the Cache la Poudre is typical and one of the best examples in the west, because it has all of these conditions, that is, it has been a pioneer. A pioneer in construction, because the same needs are there. It has developed a little earlier than some of the others. It has therefore been a little ahead of some of the other valleys in the state. It has felt the need of various administrations and of legislation, and a great deal of that in this state originated in the needs of that valley.

The Poudre Valley has been very much as I stated a few moments ago. From 1859 to 1870 there was a period of individual development running into small ditches, confined almost entirely to the bottoms. I do not think that those were confined to the bottoms for the reason that has sometimes been stated, that the people did not believe in the uplands, but because they did not want to go to the upland.

1442 During that time there were a number of ditches built in a number of individual cases, then from about 1870 came the development of community or company ditches. Then came the location of the Greeley Colony in 1870, and they started out with three ditches planned, two of which were constructed by them and the third built some years later by a corporation. This latter ditch was constructed by the Larimer and Weld Irrigation Company. Governor Eaton was the contractor and was interested. It is called the Eaton ditch. It is near Eaton in the eastern part of the valley.

That second stage of development came with the Greeley Colony. Fort Collins was organized the year following as a kind of an offshoot of the Greeley Colony. Some of the seceders and others who did not get in in time to join the Greeley Colony and some of the

officers of the Greeley Colony who thought they had a chance to build another town, organized another community and there were those two centers. Starting from that period came the development of some of these ditches. Fort Collins built several ditches adjacent to it and almost immediately afterwards came the Larimer County Ditch, built in the early 80's. Those were the company ditches, built largely, or at least inspired by local influences, with the aid of some outside money. In the early 80's came such a pressure for water in July and August as I have already spoken of, especially after the development of the potato industry late in the 80's.

1413 Then came the building of some reservoirs. There had been one or two built by earlier ditches as kind of a side issue; but late in the 80's the Water Supply Ditch found they were short of water. They then planned an extensive system of reservoirs. They built several. The Terry Lake was built by the Larimer & Weld Company and they began an extensive reservoir construction. Parallel with that development and almost simultaneously with it, came the looking for water across the divide.

The reservoirs and the taking of water across the divide were simply two methods of accomplishing the same purpose, that is of supplying water. Almost at the same time this Water Supply & Storage Company started to take water from the Michigan, from the Laramie and Lost Lakes, from the head of the Grand, and also planned to take water from the Laramie, which subsequently developed into the Sky Line Ditch. I visited the head waters of the Poudre in 1888, I think it was, and they were taking water from those sources. I was at Chambers Lake and the man was there then, who was attending to the taking of water from the Laramie Lake and Lost Lake, Michigan Creek, and he was doing some work I believe upon the Grand. I did not visit those places except Lost and Laramie Lakes myself.

The Sky Line Canal was constructed two or three years later and the Grand River Ditch subsequent to that, but they were taking some water across the divide at that time, I was advised.

If permitted to flow in its natural course, the water which they were diverting from the Grand River would have gone into the Gulf of California and into the Pacific Ocean. That diversion

1444 brings the water which would have gone into the Pacific over into the Atlantic watershed.

Whether water be taken across the divide or be conserved by the building of a reservoir, these are simply two steps to accomplish the same purpose and which step is taken depends upon the local conditions. In some places they have reservoir sites and prefer reservoirs. In some places they do not have reservoir sites and they do have opportunities to get water from a neighboring stream. In some places they can combine both of these and we find that general situation all over the world. It is generally true that water is diverted from one watershed to another owing to an abundance of supply in the one case and a shortage in the other. It can also be stated that sometimes, as in the case of Indian cases, it is done through several watersheds and by what might be termed a series of exchanges. I am

familiar with the tunnel of the Greeley-Poudre Irrigation District, commonly called the Greeley-Poudre tunnel. That involves the taking of water from one stream to another, in this case through a tunnel instead of over a pass, and in this case it is also from two branches of the same stream system.

The water is taken from two branches of the Platte River 1445 which is a tributary of the Missouri. The water is taken from the Laramie river, which is a tributary of the North Platte, and diverted into the Cache la Poudre, which is a tributary of the South Platte. These two branches of the Platte then unite to form the Platte in western Nebraska near the town of North Platte, so that in this case the diversion is between two branches of the same stream system. This diversion differs in no way from the Sky Line diversion from the same stream, except that the Sky Line is brought over a summit and this is brought through a tunnel.

I have had occasion to observe diversions of water from one watershed to places of use upon another watershed the world over. It is practically a universal custom. I think the first case that I came in contact with was the Water Supply & Storage Company, but I find a number of instances in this State, and as my acquaintance with other states increases, and other regions, and my knowledge is broadened by practice elsewhere, I find a great many instances. I have come across some in person and that led to some examination of the question, and shows the universality of the custom.

The diversion has been prompted through the need of water in one watershed with the other watershed providing the most 1446 feasible and practicable way of obtaining water. It simply is one step in supplying the need. In some other cases it has been also governed by some or other additional considerations, as, for instance, the place of greatest use.

If inter-watershed diversions had been prohibited in the many instances I have observed, it would have prevented the development of a great many communities and of millions of acres. It would have lessened the food production for quite a large number of the human race, for, I think it is pretty well known, that practically seven-eighths of the food of the human race is raised by irrigation. This is not true of our Anglo-Saxon people, but of the people of the world as a whole it is true. So that immense areas would have remained idle and as in India, the loss from death by famine would have been very much increased, in fact, some of these cases in India were forced for the prevention of famine. In some of these cases they have been forced to this character of diversion.

The custom of using streams as natural carriers of water from one part of a system of works to another is as universal as the need. Whenever the stream is so situated and the land to be served is so situated that the stream is convenient for that purpose, it is done without limit. If the land is situated where the stream is 1447 not a convenient carrier, they bring it in another way.

I will review a number of cases of foreign countries in which inter-mountain or inter-watershed diversions have been practiced for centuries, or are in practice at the present time, and



will state the purposes for which the diversions were made and what has been accomplished by these diversions. For this purpose, probably, India might be the most notable example, simply because of the scale on which the works were carried out and the fact that it has been a country densely settled for thousands of years and has been in many respects a country of high civilization. Perhaps the first one that might be mentioned is the ancient one connecting the Ganges and the Indus. I might digress a moment to speak of the general topographical characteristics of India. It has on the north the Himalaya Mountains, of very great elevation, with large rainfall, and filled with glaciers and glacial lakes at many places. At the base, on the south, the peninsula is practically cut across by river systems of the Indus and the Ganges. The Ganges flowing eastward to the Bay of Bengal, and the Indus flowing westward to the Indian Sea. These two streams practically catch all the run-off of the Himalaya Mountains. They have many tributaries of large size, some running then into the Ganges and some into the Indus. The Divide between the Ganges and the Indus, in the central part of the continent, is rather a low divide, while there are mountains in the central parts of India and Hindustan that are south of these rivers. There have been diversions from these streams from a very early date. Of course, that was a country of high settlement, of great intellectual development and also of centralized authority.

The western tributary of the Ganges is the Jumna, that is almost on the border line. It runs down from the Himalayas and flows eastward into the Ganges. There is a tributary of the Indus a few miles to the west, that is, this runs through a number of other streams like the Chitang and then into the Sutlej.

There seems to have been a canal built across this watershed as early as the twelfth century. This was built by a celebrated Indian ruler, Feroz. His name is still identified with some of the cities and other portions of that country. After being used for quite a number of years, it seems to have fallen in disrepair and remained unused until it was reconstructed in 1568 by another ruler of great energy, Akbar. It again was allowed to fall into disrepair in their troubles that arose, and through lack of energy of the rulers, and it was rebuilt about a century later by another ruler, Shah-Jeham.

When the British took charge of the country, they found this, then, largely in bad order. Warren Hastings took an active part in attempting to get this reconstructed, and I think some of the things that he was accused of were because of his attempt of such enterprises of this kind. So it was practically rebuilt in 1820 by the English, and they reconstructed it on a still larger scale in 1870, not in rebuilding the canal as a whole, but in reconstructing to avoid a great many troubles that had shown up. It is now 84 miles long and supplies 555,000 acres, and carries about 2800 cubic feet per second. It carries water, with some of its tributaries, as far as 125 miles west of the Jumna to a place known as Sirea,

so that practically all of its acreage is outside of the watershed of the stream which supplies it.

The canal to which I have referred is called the Western Jumna, the western one from that Jumna river. The map (defendants' Exhibit 22) shows both the Western and Eastern Jumna canals. The eastern canal is the one diverting from the east side of the river and the other, marked "Western," and that is the one of which I have spoken, diverts from the western side of the river. The work from which this map is obtained is Bairds-Smith Volume of maps on Italian Irrigation, 1855. The reason that comes in that unusual place is because he was an Indian engineer. This volume is marked the second edition.

I might state as a matter of interest, that this canal has repaid the English Government all that it outlayed and \$5,000,000 besides. This is in addition to the tax returns which the government receives directly.

I will now mention the series of diversions that are now under construction in the Indus Valley. The Indus is the river flowing down the western side of Hindustan and taking a lot of the 1450 streams from the Himalayas. This is an extension of the same plain that this Western Jumna irrigates. There are a lot of old canals that run back to an unknown time, some of them built by private parties, more built by the native rulers; for there are several native states there that are not under British control. That whole plain, at times, suffers somewhat from scarcity of water, or perhaps it ought to be said that the valley does not produce as much as it might produce if it had more water. As a matter of fact the yield is quite large but occasionally they have some shortage in crops and the population is so great that in such cases there is a famine and a loss of hundreds of thousands of lives. So the English have planned to extend the diversion. There are several streams that run into the Indus: The Jhelum, the Chenab, the Ravi, the Sutlej, and all of them are enormous streams as compared with the streams we have to do with here. Each of them has a large system of canals. Now the Indus lies to the west, and the others come down from the Himalayas in succession.

(Defendants' Exhibit 23 offered in evidence.)

These streams and the proposed canals to supplement the existing system, are shown in Exhibit 23 of the defendants. In this case, the English proposed to build a canal starting from the Indus and running over to the Jhelum, a distance of approximately 60 miles. This water will then be available to supply the other ditches down the Jhelum and enable them to take out another ditch about 100 miles higher up the river that will carry water from 1451 the Jhelum over to the Chenab and those can ordinarily supply some of the other ditches on the Chenab, also enable another ditch to be taken out of the Chenab at a higher elevation, about 40 miles up the stream, and run across to the Ravi about 100 miles. That is made possible by the substitution of the water of the canal for the water diverted above, and then carried on be-

yond the Ravi to the lower Bari Doab Canal. So that the taking out of the water from the Indus in the first place, or from the Jhelum where the construction is now under way, really is intended to supplement the Bari Doab Canal a distance of 50 miles or more and to cross over the large streams by a system practically of exchange, but in effect carrying the water from the first stream across to the last. By exchange of water I mean the practice that is familiar to irrigators of supplying early rights by water from some source in a corresponding amount at some other point; very frequently in Colorado, on a great many streams, the Big Thompson and Poudre, largely by use of reservoirs. It is a matter of substitution.

There has been quite a large amount set aside for this construction and reconstruction I believe is under way. I don't know that it is completed.

The next one that I call attention to is of a very similar character, but over on the eastern slope of India; that is in the Ganges watershed.

(Defendants' Exhibit 24 offered in evidence, being a sketch map of a portion of the United Provinces of Agra, Oudh, and Punjab.)

Exhibit 24 was prepared under my direction from a map 1452 of the Indian Irrigation Commission. The canals of the

Ganges system here shown, are at the upper portion of the Ganges river. It includes the Ganges, the Jumna and a number of others, the Ramganga and others in this region covered by the Ganges Canal. I will say that the Ganges canal from the point where it takes from the Ganges river to its lower end is something like 500 or 600 miles, and forms, of course, a canal of great size, something like 200 feet wide and twelve to fifteen feet deep at its head. It, in its course, carries water out of the Ganges basin over into the basin of the Hindan and also over into the Jumna basin so that the waters interlace through these various streams.

In order to build that Western Jumna Canal and to extend over some additional country west of the Jumna, they are afraid they will run short of water for the Eastern Jumna Canal, and hence the plan has been considered of supplementing the supply of that Jumna Canal from some other of these streams. The plan under consideration, proposed by the Irrigation Commission of India is, in the first place, to set over some water now used by the Ganges Canal by building a supply canal from the Sardah river about 150 miles long running over to the Ganges, and by so doing, supply the lower Ganges Canal. That then, involves an increased amount to be taken out of the Upper Ganges Canal about

1453 150 miles upstream, and that increased amount taken out of the Upper Ganges can be delivered over to the Eastern Jumna Canal by a branch about 20 miles long, and thus lessen the demand on the Jumna river, and increase the supply for the Western Jumna which runs over on the other side of the Continent. There are several accessory branches proposed, as for instance from the Hindan down to the Jumna to be supplied however by the water from the Upper Ganges Canal. The result of this proposed con-

struction is practically then, to enable the water of the Sardah River to be used about two or three hundred miles to the west, over on the western slope of India, while the Sardah is a tributary on the eastern slope.

(Defendants' Exhibit 25 offered in evidence.)

Exhibit 25 is a sketch map of the Periyar project in southern India. It was prepared under my direction. Exhibit 25 shows what is known as the Periyar project in southern India, that is in the Madras presidency, while the other projects so far referred to in India, are in other provinces under English control. This is in the Madras Presidency and is almost at the southern extremity of the Hindustan Peninsula.

In this case water is carried across the Continental Divide, or from water that is collected on the side of the Arabian Sea, carried by a tunnel through the mountains—the Western Ghats—thence delivered into a stream, the Vaigai river, and carried a distance of about 60 miles to the land to be irrigated. The tunnel is about 6,000 feet long. The reservoir that is constructed, is 8 or 10 miles long, and has a dam nearly 150 feet high. The reservoir is just adjacent to the tunnel and the reservoir is at the upper end of the Periyar river which flows into the Arabian Sea, while the land that is to be irrigated along the Vaigai river is on the side of the Bay of Bengal. This river discharges almost opposite Ceylon. It has been completed for quite a number of years. Since 1896 I think. It is expected to irrigate about 120,000 acres.

The cost of this project is not as much as that of the Greeley-Poudre project. The reservoir is a larger one and is parallel in many ways to the Greeley-Poudre proposition, but with some less cost. The tunnel is less than half as long as the Greeley-Poudre tunnel. It is 5,704 feet long, while the Greeley-Poudre is 11,366 feet. Practically one-half of the length of the Greeley-Poudre tunnel.

I might say here, as to these enterprises, that this enterprise was examined and reported on in 1898, and the steps in this illustrate the conditions I mentioned earlier in my testimony. It was, however, premature; the times were not ready for it. So it was again taken up in 1867, for the time was then riper for it, and it became an enterprise that might be seriously considered and was built in 1888 to 1896.

(Defendants' Exhibit 26 offered in evidence.)

Exhibit 26 is a sketch map of another portion of the Madras Presidency in southeastern India to illustrate its transfer of water from one watershed to another. It was prepared under my supervision. It is based on a map of the Irrigation Commission of India of 1901 and 1903, No. 2. It represents two streams running down from the Ghats, that is the central divide of India, into the Indian Ocean. These two streams being the Kistna and the Penner, and it shows one canal already constructed and taking

water from one stream over to another stream, a distance of something like 100 miles, and two others that are under consideration.

On this map the canal that is constructed is shown by a full line and canals that are under consideration are represented by a dotted or broken line.

The canal that is built is referred to as the Kurnool-Cuddapah taken from two towns at the ends, that is Kurnool is near the head of this canal and Cuddapah is at the lower end. This canal was built to carry 3,000 feet per second and to supply the country in between for irrigation and also for navigation.

There are two other projects proposed, one above and one below this Kurnool project, the upper one is spoken of from the name of the stream which it taps which is a branch of the Kistna, called the Tungabhadra.

This would take water about 100 miles above the Kurnool Canal, carry it across several tributaries, and deliver it into a reservoir near the summit of the divide, water a good deal of land on both sides, and finally deliver into the branch of the Penner river, thence across through into another branch, so by two or three successive ditches reach land in the Penner Valley. These two streams, the Kistna and the Penner are both independent streams flowing into the Bay of Bengal. Their water sheds are distinct from

1456 one another. The other canal that is represented by a broken line is proposed as a part of a very much larger enterprise planned by Sir Arthur Cotton, to connect up a large part of the eastern part of India and even to extend to the Ganges. However, it has not been built, as yet, but it is under consideration, and is reported in this report of the Indian Irrigation Commission.

These are the most notable examples of inter-watershed diversions on a large scale in India. There are others on a lesser scale that I have run across and undoubtedly there are any number of smaller ones if looked into — the native states. The native states have no maps available.

These inter-watershed diversions that I have mentioned are diversions from one stream to another that are not tributary to each other.

These diversions are simply made whenever the conditions are favorable, if they have water they can get they plan a diversion from it, but some of these are of a very large class because the Gov-  
1457 ernment is interested in them and the Government has constructed them on a larger scale than almost any native country or rulers can. As a matter of fact there are private ditches there, not Government ditches, that run up into hundreds of millions, but they are not indicated in these Government reports.

In each of these cases I have specifically pointed out, had these inter-mountain or inter-watershed diversions been prohibited, it would have meant the loss of millions of lives by famine in India. In fact, many of these canals and diversions have been taken up as a result of a report of the Famine Commission of India about 1898, I think, that suggested some of them, but by no means all. They are entirely a result of the natural growth and development of the region.

Decidedly larger areas are made productive by this method than would be otherwise. A great deal of the water would run to waste otherwise. Necessity has produced the construction of most of these works.

I have looked through the Government Reports, I have a dozen or so, and I have never found any legal objection against these diversions because of their inter-watershed character. This class of diversions seem- to be taken as a matter of course to which they 1458 seem to have no objection whatever. There seems to be no more objection presented to it than to taking from a stream within its own shed.

I have investigated inter-watershed diversions in France. I have visited a number there and have learned the condition of quite a number. In these cases I have gone over the ground and have visited most of these canals to which I will refer.

In southern France we have conditions such as I have spoken of where the development of the country called for more water. The rainfall was light and there was water across on the other side of the range of mountains or divide as the case may be. This general statement relates to all that part of the Mediterranean next or near the city of Marseilles, from there eastward, and it also pertains to a greater or less degree to the interior of the country, up along the Rhone for some distance from the coast and practically that portion of the country settled by the Romans in the early days, many of their ruins still existing. Right adjacent to Marseilles there are a number of canals brought from a stream to the north known as the Durance. The Durance is a tributary of the Rhone and drains a portion of the Alps. It is separated from the coast by a mass of mountains, and on the south side of these mountains the rainfall is very light, 6 to 10 inches, and a country of beautiful climatic conditions. It has given rise to a development of a large commercial city like Marseilles, and a number of cities further east like 1459 Nice and Monaco. It is a condition where water is desirable, where the land produces very much with the application of water, and consequently there have been attempts to obtain water from the very earliest time.

The Romans built canals of record length to supply a part of this country along the coast. Near Marseilles and north of it, is a plain know as the Crau, separated from the Durance by a height of considerable elevation and canals had been proposed and built to supply that plain for some centuries. There are two canals, in particular, the Canal of Craponne, and the Alpine Canal or Canal des Alpine, both taken from the Durance, bringing across a saddle and delivering water on this plain. The Craponne was built about 1650, by a man named Adam De Craponne. It covers this plain northwest of Marseilles and east of the old Roman city of Arles. A part of the water finally reaches the Rhone but most of the land it irrigates is not tributary to the Rhone, but is tributary to the Mediterranean Sea. The Alpine Canal was built about a century later, 1772. It passes through the same saddle that the Craponne Canal does and covers very much the same territory.



There will be shown in a sketch map that is not ready today to be marked as Defendants' Exhibit 27, a portion of the development of Bouches du Rhone.

Exhibit 27 also shows two other diversions across the watershed of somewhat similar character. One of these is the Marseilles Canal, taken likewise from the Durance, running through the same range of mountains but delivering to land in the suburbs of the City of Marseilles and supplying also the City of Marseilles with water for domestic uses.

1460 The latter canal was built between 1840 and 1850. It was principally a matter of health, for the city at times had been very short of water. It is a very extensive canal with many masonry aqueducts. I visited the headworks of all of these canals in 1892.

The same Exhibit, No. 27, also shows the Verdon Canal. In this case the Verdon Canal takes from the Verdone river, which is a branch of the Durance and carries water through the mountain divide and delivers into the basin tributary to the city of Aix. It supplies this small town with water and irrigates that whole basin. This canal was built about 1867, I believe, and irrigates about 40,000 acres as well as supplying the town with water. To be more definite, it was started in 1863, and it was finished in 1874. It is very interesting from an engineering point of view, but of moderate size as compared with the Indian canals.

The Craponne Canal comes over a saddle in the divide. These conditions are somewhat similar to the Sky Line Diversion, or any of those coming through the saddle, like the one coming from the Michigan, or the Grand River ditch of The Water Supply & Storage Company, in Colorado. The Canal des Alpine is of exactly the same character as these Colorado diversions.

Exhibit 28 is being prepared under my supervision, from 1461 an official map of the area where the Carpentras Canal is located. It is called a map of the Carpentras Canal. It shows a portion of the Vaucluse. The Canal Carpentras takes water from the Durance canal or headworks of the Marseilles Canal. They are perhaps two or three miles apart. I stayed all night with the headgate man of this canal, and walked between these two places in a very short time. The Carpentras Canal takes from the Durance, runs to the north, while the Marseilles Canal and others mentioned extend to the south. It then covers territory between the Durance and the Aiguis river or torrent, rather, a tributary of the City of Avignon. It also crosses the historical torrent or historical stream of Vaucluse and also supplies territory near the City of Carpentras.

This region has been irrigated from very early times. There is now a charter of a ditch on file at Avignon dating back to 1101.

There were a large number of other ditches that were built from that time up to the present and this present canal of the Carpentras was really an extension of ditches that were built quite a long time ago; so that this name properly only applies to the extension. There are other concessions or charters of ditches there, dating back to the twelfth century, there is one, for instance, dating 1171, and the

records of Avignon have a good deal of this water matter; that is, there are charters of ditches, of the transfer of water rights to lands, and regulations concerning management of ditches.

Those have been preserved because the concessions were sometimes to religious communities. In fact, this document of 1101 refers to a transfer of water from an existing ditch the date of which is not known. This Canal of the Carpentras was projected apparently in 1536, and received the permit of the legal Parliament or legal counsel, but the affair seems to have been suspended because of the religious worries of that time which resulted in the massacre of St. Bartholomew's Eve; then taken up about a century later, and then had trouble because of the financial panic due to John Law in his Louisiana scheme which created so much trouble in France. Some of it was constructed about 1780, nevertheless, but the present canal was taken up seriously in its extension in 1849-1850 and completed in 1858. In this case the water is taken across a number of tributaries of the Rhone and for a distance of something like 40 miles along the foot of the mountains.

Another canal in France, the use of which constitutes an inter-watershed diversion, is the Canal of the Gap, so named because of the town of Gap. It is east of this last canal and diverts water in the opposite direction. It diverts into the Durance water-shed from the Isere watershed. In this case the enterprise practically surrounds the Carpentras Canal. That is it is further from the Rhone and takes from the Isere which empties into the Rhone about 75 miles north of Avignon, and thence runs into the valley of the Gap which is a part of the water-shed of the Durance. It runs for some distance through an open channel, and then through a tunnel which is nearly two miles—3,640 meters, long, and thence delivers into the valley of the Gap and distributes on both sides of the valley by two canals. The stream that it takes from immediately is called the Drac.

While we had in these other countries examples where the water was taken from the Durance, in this case the water it taken into the Durance, just reversing the operation, and illustrating again the general principle that wherever the conditions call for water and water is available it was apt to be captured in that way and transferred as a matter of economic development.

(Defendants' Exhibit 29.)

I am having prepared a sketch map showing this canal. It will be marked and introduced as defendants' Exhibit 29.

This concludes all of the French diversions I am going to refer to. The general principles involved in the diversions in France are the same as the diversions in India to which I have referred. There is a difference in magnitude, but where the conditions called for diversion, they have done it. The diversions are the result of the same general conditions. So far as France is concerned, irrigation is not practiced to any extent, except in this portion of the state, the extreme southern part.

If these diversions which I have mentioned had not been made in

France, it would have made probable the loss of a great many lives at Marseilles, which has had in its past years, a great loss of life from lack of water, and it would mean the failure or suspension of population east of Arles on those plains that now is very easily supported by this water, and so it is in the vicinity of Avignon. Before

this canal was built land was worth about 300 francs per 1464 hectere, that would be about \$25.00 per acre; it immediately jumped to over \$100 per acre before water was available, as showing the high value of water in the needs of this land at that time. Along in the '50's and since that time, of course, it has gone up very much higher. In other words, there were conditions justifying such application of water as indicated by the price of lands. That shows something of the conditions.

Had these diversions not been made, that country would have been developed but to a small extent, that is, there might have to be olive orchards and dry crops and very precarious existence. In southern France conditions are such that they try to cultivate all the land and its productive capacity is very much increased by the use of water. Without irrigation it is on the verge of failure, and when there is a little less rainfall than usual it brings a complete failure, but the taking of water across has not changed the total area which they attempt to crop but it has enormously increased the productive capacity.

1466 There are other instances of diversion of water from one stream for application on the watershed of another stream in France. I mentioned yesterday most of what might be termed the important ones that I am acquainted with, but the canal of Neimes might be mentioned because of its historical importance. It is not a very large one in capacity, but still it illustrates the same facts that they are inclined to build a canal under the pressure of need and without any thought where the water comes from as far as that is concerned or where it is applied. The impetus generally comes from the point where it is to be applied.

The City of Neimes was an old Roman city like Arles, Avignon, Marseilles and Aix, and a small amount of rainfall especially in the summer, that needed water both for irrigation and town supply. The City of Neimes had a canal bringing water for about 15 miles as I recall, through tunnels, and by means of celebrated aqueducts to the City of Neimes.

(Defendants' Exhibits 30 and 31 offered in evidence.)

Exhibit 30 is a photograph of the aqueduct of Pont du Gard taken from one end, taken in 1892 by myself on a visit to that locality, and shows the aqueduct from the lower end as it crosses the Gard. At about one-third of its height is seen a series of arches attached to the side of the main aqueduct, built by the French about 1760 as an addition to the side of the aqueduct to carry a road. The aqueduct itself was built about the time of Christ, I think in the reign of Augustus. The channel is above the uppermost series of arches. This aqueduct is one of the most celebrated irrigation works of this character in the world because of its beauty of propor-

tions. In order to make this masonry conduit, there were three series of superimposed arches carrying the tunnel, the upper series being smaller and resting on the top of the second series of arches.

The water was taken to Neimes for general city purposes, to the Roman baths and for irrigation of the gardens in that vicinity.

Exhibit 31 is a view through a tunnel, a little below the end of the aqueduct shown in Exhibit 30. It is a tunnel built by the Romans to carry water through a ridge. It is about 300 or 400 feet long.

1468 The photograph was also taken by me in 1892.

(Defendants' Exhibit 32 offered in evidence.)

Exhibit 32 is a photograph of a masonry aqueduct on the canal of Craponne, which was mentioned in the testimony yesterday. This aqueduct was one near the City of Arles on one of the branches of that canal and near its extreme end. This was taken by me in 1892. The aqueduct was built about 1654.

(Defendants' Exhibits 33 and 34 offered in evidence.)

Exhibits 33 and 34 are both photographs of an aqueduct on the Carpentras Canal as it crosses the Vaucluse stream. This is the canal referred to in the previous testimony. These photographs were both taken by me in 1892.

The diversions which I have mentioned are typical of the enterprise in France as developed under the conditions and necessities of the case.

In Italy, the conditions are somewhat analogous to India, but on a very much smaller scale. That is, there are a series of streams coming down from the Alps on the north which join and form the stream known as Po. These streams coming from glaciers of the Alps, are quite large and fairly continuous because many of them are held by glacial lakes or reservoirs like Lake Como, and Lake Maggiore.

This is the greatest region of irrigation in Italy because of the extent of the Valley of the Po, its water supply and ease of irrigation; but does by no means comprise the entire irrigation of Italy. It is the one that is spoken of in speaking of Italian irrigation.

The irrigation in the valley of the Po goes back to a very early date and there were large canals built in the twelfth and thirteenth centuries especially near Milan, a town near Venice. There are two canals known as the Naviglio Grande near Milan, and the Muzza Canal also near Milan, one coming from the west and one from the east. The Canal Biana was another large canal built lower down the Po, and there were quite a good many of considerable importance built at an early date. The Biana was built still earlier than the twelfth century.

There were canals dating back very much further, but those represented the same characteristics that have been spoken of in the development of irrigation in the United States; that is; they were simply canals built to supply small areas or built by individual land holders which in some cases were the old monasteries, one of the

largest was built by a monastery out of Milan. Then there were those of smaller canals built from Springs, etc.

When they found the increased value from irrigation, and the search for water came, and they went farther for water supply, and the next step, likewise, that of tapping streams further away and bringing them across intervening streams. Projects were proposed and considered by the local association, and sometimes by the Government, and out of them all, two might be especially mentioned, that have been built and under consideration for a long time and led to a variety of plans, but all essentially to the same purpose and not materially differing in character. These two canals I refer to here are the Cavour Canal and the Villoresi. The first named after the Italian statesman who accomplished the unification of Italy, and the second for an engineer who had been responsible for one of the plans of the second canal.

These two canals supplement each other something as some of the canals described in India on the Jhelum and Ravi. The Cavour Canal takes its supply of water from the Po, or rather I should say, a part of its supply from the Po and traverses the provinces of Piedmont. It takes a large part of its supply, however, from a wide stream, the Dora Baltea. That canal is used to irrigate a portion of Piedmont north of the Po river directly, and by supplying a system of canals that are already in existence. The latter would be called a system of exchange, supplementing the supply. It supplements the supply as obtained by those canals from other sources. It ends at the Ticino river on the east border of Piedmont.

(Defendants' Exhibit 35 offered in evidence.)

Exhibit 35 is a sketch map of the Cavour Canal, with some of the other canals showing that it starts near the city of Turin, derives its supplemental supply from the Dora Baltea, crossing the Elvo, the Carvo, the Sesia, and other streams, and supplying the lands in their water-sheds and ending near the city of Novara on the Ticino.

(Exhibit 36 of Defendants offered in evidence.)

Exhibit 36 is a sketch map showing the Villoresi Canal that takes water from the Ticino below Lake Maggiore, and irrigating the region north of Milan and extending to the east. It is what might be called a high line canal. The Villoresi Canal was built more especially to irrigate the province of Milan, while the Cavour Canal was for the Province of Piedmont. The Cavour Canal could be extended into the province of Milan; but its level would have been so low, that it would not have covered much of the country that was capable of irrigation. So that the Villoresi Canal was started from the Ticino at a higher elevation, but is essentially an extension of the idea of the Cavour Canal.

The Cavour Canal was built between 1860 and 1870 and the Villoresi Canal built about 1880. These are all built and are very extensive systems.

The water is used entirely for irrigation in both cases. The lands

are all fertile lands of the Po. They are very largely used for crops, principally hay. The annual rainfall is about 36 inches, so this is used to supplement the rainfall and bring additional water. That valley is one of the thickest populated regions in the world, largely caused by irrigation.

The Canal Emiliano is something of the same character that has been under consideration by the Italian Government directly for twenty years and has been planned for a long time before that. It is designed to irrigate the region near Bologna, Parma, and Ferrara on the south side of the Po and on the Adriatic Sea. This has been reported on by the Government Engineers and has been recommended; but I think the matter of money have prevented its execution up to the present time. It is planned as a large canal at the foot of the hills. It is described in parts 14 and 15 of the Italian Government's reports on the "Carta Idrografica D'Italia."

There are no other instances of special note. There are some along the Apennines and so on that are reported in these cases; but I have not made any particular attempt to trace these out. These are bound to be small; but would be in kind, illustrating the general principle shown by these already given, that they take water freely from any stream that may be available.

I have failed to find any objections ever presented or any such manner of diversion and application of water in Italy. I have looked through the Government reports and other literature of all kinds, some, by the way, running back to the fifteenth and sixteenth centuries, in a series of authors on water in Italy, and in no case has any reference to objection on any such score been made that I have found.

I have failed to find any objection ever presented in France to this manner of diversion and application of water, in any of the descriptions of canals, projects, or in any literature on that subject that I have seen.

1473 I have made search, to some extent, to ascertain the conditions in Spain relative to inter-watershed diversions and applications. The available descriptions in Spain are much fewer, or at least such as I have been able to find, although there are many indications that such a custom prevails.

The irrigation in Spain runs back to an unknown period and that is the reason, perhaps, that descriptions are lacking. That was a very thoroughly irrigated country in the time of the Moors, who systematized irrigation, and the southern part of Spain has been irrigated through portions of it from the earliest date.

The rainfall at Madrid is about the same as Denver, 15 inches, and it has about the same latitude and prevailing weather, but considerably hotter. All of these ancient cities that were occupied by the Romans used aqueducts of great extent and considerable length, so the custom of irrigation was common because of the necessities if the case.

In some of the recent canals, the conditions are such that the canals take water across divides, but I have no maps, and very little descriptions except those like the Henares Canal and Isabella Canal.



Both have been constructed for some years, and irrigate in the neighborhood of 70,000 to 75,000 acres each. The Tamante Canal was taken up some years ago, but I am not certain that it has been built. It was to irrigate nearly 600,000 acres. I am unable to present maps of those, and therefore cannot speak definitely as to the conditions; but along the Mediterranean Sea near Valencia there are some of the old canals dating to the time of the Moors, analogous to those on the India coast of Madras, where they take from one stream which flows into the Mediterranean and carry it over into another stream flowing also into the Mediterranean. Thus for instance, here is a canal from the Zucar and extending over into the Cataroia, and also canals from the Guadlaviar, extending likewise to the Cataroia, and also in the opposite direction one extending to the small stream of Rio Secp. These date back to a very early date.

This particular map that I refer to is given in Volume 2 of Tassa's description of irrigation in Spain.

The rule of need and convenience has governed these diversions in Spain, that where they needed water they obtained it from any source that might be available and could furnish it.

I know of no objection having been raised to such diversions. I do not think there could have been any, because the practice has gone on so generally.

I know of inter-watershed diversions in other foreign countries. For example, between China and Turkestan the conditions there are favorable for such diversions at the head of the Chinese rivers to those running into Turkestan, and the Russian Government engineer who had charge of Turkestan and the irrigation works of that country described such diversions to me some years since, at a time when he was spending some days with me. His name is E. E. Skornia-koff. I do not have a map of such diversion, but I have a map of the adjacent region of Turkestan showing same in general, crossing from one stream to another, and irrigating the old city of Tashkent, and its vicinity. There were here a number of canals shown on the topographical map of that portion of Turkestan showing water taken from one stream to another.

I know of no rule governing these inter-watershed diversions except the same rule that has been evidenced elsewhere, that where water was available and land was needing water, it was taken without any regard to divides or considering any more than the physical obstacles that needed to be overcome as to the water of the stream itself. It was a mere physical difficulty.

There is another instance that might be mentioned on the Upper Nile that is proposed by the British, but is not as yet constructed so far as I know. That is at the extreme end of the Blue Nile, and the English have proposed that a tunnel be taken from this lake about two miles in length diverting into another branch which would drop into the Nile about two or three hundred miles below the Blue Nile, but instead of carrying it down this stream, take it out across the Blue Nile over into a country that is not at present irrigated. That project has been proposed by the British as reported in their official

reports and apparently will be taken up when the time comes. And no objection of any kind has been given to it, in fact the question has been considered by the Government.

1476 The various instances that I have enumerated are typical of diversions in the Western Hemisphere. Where conditions are favorable I should look for such diversions, but such places are not very common, for instance, in Australia there are practically no places where we could look for diversions because of the relative shortness of the streams and comparatively few of them. In a great many other countries they undoubtedly exist, but I have no definite information that I could supply at this time. I have a map of a portion of the Alpine region of Germany, but I am not able to present it at this time.

We have quite a number of inter-watershed diversions in the Western Hemisphere outside of the United States. We have first in Canada quite a number, either constructed or under plan of construction.

In British Columbia, the conditions are there such that the streams are generally small and the valleys are narrow, and as a whole the conditions are not such where there would be any call for diversion. At the same time when acting as Commissioner for British Columbia and looking into the stream records, I found a number of instances where water was diverted across divides. There are other reasons also why they would not be expected to be present in any great number in British Columbia, because the country is very new in its irrigation development. There were, however, several instances that I recall where one stream came near enough to another with a feasible divide, so that water was brought from one shed to another.

This was the case, for instance, on the branch of a stream northwest of Ashcroft in British Columbia, where it was carried across  
1477 the divide on land toward Spence's Bridge and towards Ashcroft. It was also true in the vicinity of Lake Okanagon, a region which has recently been developing rapidly as a fruit country, where water has been taken from Nelson Creek to irrigate lands to the south over towards Michigan Creek and Kelowna. These are small diversions as compared with the matters which we have had examples of elsewhere. This last enterprise was planned but not constructed, at least at that time. The question was one of funds. Near Pentictom water was taken from Pentictom Creek to the north irrigating the valleys of other branches running into Okanagon Lake.

There was a more noticeable transfer across the divides at the head of the Columbia further east between Columbia and the Kooteney. It happens in this case that conditions are quite favorable. These two streams start close together with a fairly wide mountain valley, so that the water in one runs one way and the water in the other to the north, the Columbia running north at that place. The enterprise was under construction there, taking water from one into the other.

The general physical conditions in British Columbia were not very favorable for such changes; but where ever such conditions were favorable, it was being proposed and considered without objection.

There was still another, that I am not able to locate the name.  
1478 There were several smaller changes of that kind that I found, as where water was changed by permission of the Commissioner. They had a system of permits by what in the early days was called the Gold Commissioner and he had charge practically of everything pertaining to the government and all permits were issued by him. In a number of cases I found permits of this character that planned the diversion of water from one stream to another. The physical conditions seem to entirely control in these cases.

As a member of the Irrigation Commission I did not raise any objection whatever. In fact the laws as they were, permitted it, and the laws as passed did not forbid it. It was considered one of the essential conditions to the development in an irrigated country, so it was left entirely permissible.

In Alberta, conditions are similar to the conditions in British Columbia, in fact, there are streams and large plains so that development can be carried on on a large scale, and development there is in the central government, instead of the local government. British Columbia, I may say, in passing, has been in about the same relation to Canada, as Texas has to the United States, that is, Canada owns none of the lands of British Columbia, any more than the United States does in Texas. In Alberta, on the other hand, all public lands belong to the Central Government—to the Dominion of Canada.

There are a number of streams that start from the Rocky Mountains in Alberta, running to the east mostly in the Saskatchewan drainage area. The surveys were made to some extent in the first place by the Canadian Government and an extensive series of surveys has been made by the Canadian Pacific Railway.

I have maps here of the Canadian surveys, which may be referred to by title. In 1884, is one showing a proposed method of diverting water from the Elbow into the North Fork of Fish Creek. In the report of 1897, they present a map showing the location of a canal for diverting water from White Mud river to Swift Current Creek. Also from the South Saskatchewan river to the Regina Districts. There is one in the report of 1894 from Red Deer river into the Rose Bud, and these are the official government surveys of reports showing what they contemplated under Government supervision.

In the British Province of Alberta, in the Dominion of Canada, the more recent construction has been along the Canadian Pacific Railroad from the Bow and Red Deer and connecting them together. I have not a map here of them this morning.

Practically all of the diversions in Alberta, are from one tributary of the principal stream to another tributary of the same stream. They are all in the Saskatchewan drainage area.

In the case at bar, the diversion of water is from one tributary of the stream to another, all in the Platte river drainage area. The conditions here correspond so far as that situation is concerned with those in Alberta.

(Defendants' Exhibit 37 offered in evidence.)

Exhibit 37 is a sketch plan of the Canadian Irrigation surveys to show the proposed location of a canal diverting water from the White Mud river to Swift Current Creek. It is an official map of the Dominion of Canada, taken from the report of the Canadian Irrigation surveys of the Department of the Interior of the Dominion of Canada.

(Defendants' Exhibit 38 offered in evidence.)

Exhibit 38 is also a map made from the Canadian Irrigation surveys published by the Dominion of Canada and is a sketch showing a proposed diversion of water from Elbow river into the North Fork of Fish Creek.

1481 (Defendants' Exhibit 39 offered in evidence.)

Exhibit 39 is another map from the same official report of the irrigation survey of the Dominion of Canada showing the proposed method of diverting water from the Red Deer river into the Rose Bud River. These three maps all contemplate change of water from one stream to another and proposed by the Government of Canada.

At the time these maps were presented by Canada, the projects were proposed. That was in 1897. Several of them, I think, have been substantially included in the Canadian Pacific diversions.

These three maps, Exhibit- 37, 38, and 39, are taken from the official government publications. Whether constructed by the government or someone else, they are, nevertheless, the work of and bear the sanction of the Government of the Dominion of Canada.

Again referring to the Italian Irrigation, particularly to the canals of which I spoke, I stated that I had a personal inspection of these canals during the year 1892. Most of these visits were made alone, so far as the people from this country are concerned, in company, however, with Italian engineers. There were one or two visits made in connection with E. S. Nettleton, but I think those canals were not referred to in the testimony this morning.

1482 I took photographs while on that inspection trip.

(Defendants' Exhibits 40, 41 and 42 offered in evidence.)

Exhibit 40 is a view of the headgate and regulating works of the Cavour Canal at some two miles below the city of Turin. It is the gate across the canal which regulates the flow of water into the canal a short distance from the Po. This photograph was taken by me in 1892.

Exhibit 41 is a photograph taken about the same time by me, of the intake of the same canal from the Dora Baltea. As before mentioned, the Cavour canal is supplied by both the Po and the Dora Baltea, this latter is the intake from the Dora Baltea, of the same character and near the same size as the headgate from the main river.

Exhibit 42 was a photograph taken in the same summer by me, of the Naviglio Grande Canal in the outskirts of Milan, a canal connecting the Tincino and the City of Milan, serving both for navigation and irrigation and built in the 12th century.

Exhibit 37, being a map of the White Mud-Swift Current inter-watershed diversion in Alberta, should not be passed without calling attention to the fact also that this a proposed diversion from 1483 a stream flowing into the Missouri watershed, into a stream of the Hudson Bay drainage, or into the Saskatchewan drainage. This is in Alberta, proposed by the Canadian Government. I do not think it is constructed, but the matter has not been dropped because of any objection to the proposed transfer of water from one watershed to another. The White Mud comes into the United States finally about 30 miles from this proposed diversion.

The United States Government, through its Reclamation Service has proposed a good many inter-watershed, or trans-mountain, diversions from time to time. They have constructed two, or are in the process of constructing two at least and propose more. One is completed and one has had a good deal of money expended on it. I refer in these to the Strawberry Valley Project in Utah. This is a project of the United States Reclamation Service, practically completed and takes water from the Colorado river which flows into the Gulf of California, and carries it through a tunnel into the Great Basin of Utah, the interior basin. The Interior Basin drainage terminates at Salt Lake. There is no outlet to Salt Lake. 1484

They are to build a reservoir on the Colorado river side, have built a tunnel through the mountains and this tunnel has been completed, or at least the headings will be connected some time this season. The total cost is estimated at nearly two millions of dollars and about 69% of it is reported as being completed. The total length of the tunnel is something like 19,100 feet. It is called the Strawberry Valley Project because of the stream on the Colorado river side where there is a large reservoir being constructed. It is expected to irrigate about 50,000 acres. That is reported and maps are given, and other information appears in the various reports of the U. S. Reclamation Service.

(Defendants' Exhibits 43 offered in evidence.)

Exhibit 43 is a sketch map of this Strawberry Valley project, showing the general relation of the tunnel and diversion with respect to the Colorado River and also in reference to the Interior Basin of Utah. Utah Lake, which is shown in this sketch map, is a tributary of Salt Lake and a part of the general basin. The Jordan river connects the two lakes.

Water diverted from Strawberry river and the Gulf of California drainage into the Jordan river and the Salt Lake Drainage will not go down the Strawberry river and will not return to that stream, but must finally be evaporated in the Interior Basin. Whatever is taken by the project will, of course, not go down the Colorado 1485 river. This case is more extreme in its nature than the diversion of water from one tributary of a river to another tributary of the same stream.

The Milk River project of the United States Reclamation Service, a portion of which is called the St. Mary's Project, also involves an inter-watershed diversion. Money has been appropriated for this project

by the Government. It is located in northern Montana. 18 per cent is reported completed up to this summer. The St. Mary is considered both as a part of and a supplementary part of the Milk River Project.

(Defendants' Exhibit 44 offered in evidence.)

Exhibit 44 is a sketch map showing the general situation of the St. Mary's Project, or the Milk River Project, and shows the fact that the St. Mary diversion from the St. Mary's river is from a stream which is a tributary of the Saskatchewan river, and is consequently a part of the Hudson Bay drainage. This is diverted into Milk river which is a branch of the Missouri, and consequently the diversion undertaken by the Reclamation Service as shown in Exhibit 44 is a diversion from the Hudson Bay drainage in Canada into the Missouri and Mississippi drainage in the United States.

It is under construction in Northern Montana. It is almost  
1486 opposite in the character of diversion, from that shown on

Exhibit 37 where the Dominion of Canada proposes to take water from the Milk River branch into the Saskatchewan, showing that both countries were willing to transfer water in that way. This sketch map, Exhibit 44, also shows some other facts concerning this proposed diversion. It might also be mentioned in this case, that after the water is transferred from St. Mary River into the Milk river by means of a short canal that it then is carried in Milk River through Canada and finally back into the United States; and that the land that is to be irrigated is in Montana, quite a distance from the point of diversion. A total distance, in fact, of something like 200 or 250 miles carriage in the Milk river before any of it is proposed to be used. This diversion is another illustration of the same principles involved in the Strawberry Project. It is not only across a watershed, but it is from one ocean to another.

There are quite a number of proposed projects of the Reclamation Service which take water from one tributary of the stream for application upon another tributary. In fact, the Gunnison Project in this state, takes water from the Gunnison and carries it through a tunnel through a ridge and uses it in the Uncompahgre Valley. This project is nearly completed. The tunnel has been completed and

the enterprise is about 60% complete. Water has been run  
1487 through the tunnel which is six miles long. Water has been run from the Gunnison river through the tunnel at least for one or two years, and when I mentioned that the project as a whole was 60% complete, I did not mean that water had not been diverted through the tunnel from the Gunnison. The Uncompahgre river drains back into the Gunnison river lower down.

Before the United States took up this Gunnison Project, the State of Colorado had made an examination and commenced construction. This was turned over to the United States afterwards and is being completed by the Reclamation Service.

There are many notable examples of inter-watershed diversion in the several States. There are numerous cases in Colorado and Wyoming. There is one between Montana and Idaho, and in fact in



nearly all of these states wherever the conditions require it. Whenever it becomes necessary and feasible to bring water across the divide, wherever they have land on one side and find water on the other side of the divide, then they make the diversion.

1488 In California the most notable example is the Los Angeles Aqueduct. That has been built under public auspices and carries water for a distance of several hundred miles from the Interior Basin, bringing water across two watersheds and finally delivering it on the south side of the Tehachapi mountains.

(Defendants' Exhibit 45 offered in evidence.)

Exhibit 45 is a sketch map of the Los Angeles Aqueduct. It brings water from the Owens river on the east side of the Sierra Nevada mountains and across the Sierra Nevada Mountains and across the head of the San Joaquin Valley, and across a second range of mountains which I spoke of as the Tehachapies, but which are here represented as the Sierra Madra, a total distance of approximately 200 miles and in fact the actual distance is 250 miles.

This diversion of water from the Nevada drainage for use upon the Pacific drainage is authorized in connection with the City of Los Angeles which needed water for all purposes, domestic and irrigation. They had difficulty in getting water nearby and accordingly developed this source of water at this distance. The stream that they intercept would run into Owens Lake. They are to use the water for irrigation and domestic use and also for power and all city uses. They will use it for the irrigation of the garden tracts adjacent to Los Angeles, and for irrigation of farms, gardens

1489 and fruit ranches. The total cost is in the neighborhood of \$25,000,000. They intercept not only the Owens River, but a number of intermediate streams. While they started with a capacity of 700 cubic feet per second, the capacity is increased to about 900 cubic feet per second.

In this case the water is transferred across two mountain ranges and from the Interior Basin of the United States to that of the Pacific watershed. By the term Interior Basin I mean the interior portion of the United States east of the Sierra Nevada mountains and west of the Colorado River watershed. It includes a large portion of Utah and Nevada. None of the waters of the interior basin reach the ocean.

San Francisco has felt the same necessity. They have been using water for many years from a watershed that does not include San Francisco and have recently been looking for an additional supply. Under pressure of need, they have sought for any available water, and have looked for water in the Sierra Nevadas, and have recently obtained permission from Congress to utilize what they term the Hetch-Hetchy Project. The permission was passed by Congress within the past week or two. That involves taking water from the Yosemite basin, and they intercept and carry it from there down to San Francisco.

Notable features of the two California inter-watershed diversions are the cost, the length and the fact that these diversions have been

contrary to the accredited custom of that state, showing they have found it desirable to practice this method owing to necessity. 1490 I refer to the riparian doctrine.

I have not made detailed investigations of many of the other states. As I have previously stated, the conditions under which such diversions take place indicate that there has a certain development taken place. It has reached such a point that the local supply of water, if not exhausted, is at least so that the conditions justify their going some distance for water. It is an economic condition. When a state is just developing, they cannot afford to go too far for water, especially when they can get it nearby. Extreme conditions warrant the expenditure of larger sums of money to accomplish the irrigation of larger acreages. This occurs as the country becomes developed.

Colorado is a state in which irrigation has been developed for a considerable time. It has conditions quite advanced, and there are a number of instances of this kind. These diversions are quite common in this state and have been so from the very first. They have been found primarily necessary by the irrigators, owing to the conditions, like the construction of reservoirs, like the exchange of water on the streams, as a matter of natural necessity. They have been recognized by law, and while at first without specific statutory authority were recognized through necessity.

I have already mentioned examples of the inter-water-shed, or trans-mountain, diversions, in Colorado. There are several at the head of the Poudre river. These are possible at that place, because of the general physical conditions. The head of the Poudre river is near to the head of the Laramie river, a branch of the North Platte, and also near the head of the Grand river.

The North Platte drainage in Colorado is situate in the North Park. The river then runs through Wyoming and into Nebraska. Waters diverted from a branch of the North Platte would, if allowed to follow their natural course, pass into the Pathfinder reservoir in Wyoming.

Waters diverted from the tributaries of the Grand river would naturally flow into the Gulf of California, and the Pacific Ocean. The diversion from the Grand river to the Poudre river is a trans-continental diversion, as well as a transfer across a divide. It illustrates again the general fact that when water is available, the question of the water-shed is simply a physical consideration.

The three ditches which I have mentioned are Grand River Ditch, taking water from the Grand river and delivering it into a tributary of the Poudre; the Michigan ditch, taking water from a branch of the Michigan river and running into a branch of the Poudre; and the Sky Line Ditch which takes water from the Laramie 1492 river and delivers it into the Poudre. There are two diversions of water from the Michigan, both coming through Cameron Pass, at an elevation of about 10,200 feet. The Michigan river is a tributary of the North Platte. Cameron Pass is the saddle in the range of mountains at the head of the Poudre Valley and separates the Poudre watershed from the North Platte watershed.

The North Platte watershed in Colorado is commonly called the North Park. There is a rim of mountains on both sides or all around it. The Grand river is at a considerably higher elevation, nearly 11,500 feet, and the Laramie diversion is at a lower elevation, of about 9,000 feet. The latter includes the Sky Line ditch and direct diversion from Laramie Lake and Lost Lake. These diversions go back for nearly twenty-five years and were constructed early because the conditions were suitable and feasible. The cost was small.

The three particular ditches of the Water Supply & Storage Company which I have just mentioned, the Grand River Ditch, the Michigan Ditch and the Sky Line Ditch or Laramie River Ditch, all divert water used entirely for irrigation in the Poudre Valley, under the canal commonly known as the Larimer County 1193 Canal. This canal is now owned by The Water Supply & Storage Company, which is a mutual farmers' company. The lands irrigated by water obtained from these three ditches are adjacent to and lap, as it were, the Greeley-Poudre district for nearly the whole length on the south side and lie immediately next to them. The lands of the Greeley-Poudre district would simply be an extension, as it were, of this same area.

In Colorado, whenever there has been a suitable justification, water has been diverted across the divide. I mean by that that whenever there was a saddle or pass which was available at an elevation not so great, and where there were streams flowing enough water to justify the expense, the diversions have been attempted more or less. The stream south of the Poudre, the Big Thompson, has practically none because the rim at the west is so high above timber line, without passes, that there are no streams of any consequence that can be diverted. The St. Vrain has nearly the same situation. In the case of Boulder Creek, there is a diversion at the head of Clear Creek. There are also several others proposed like the Henrylyn Project and the tunnel proposed by the City of Denver, which are at the head of Boulder Creek. The Berthoud Pass Ditch is south of Boulder creek and comes into Clear Creek. It has been used eight or ten years.

The Cimarron ditch takes water from the Cimarron river over into Cow Creek and then delivers into the Uncompahgre river; which stream delivers water in the vicinity of Montrose and in the same neighborhood as the Gunnison Project.

The Pine Ridge Ditch is also an old ditch diverting water from the La Plata to the Las Animas watershed. The La Plata is a tributary of the San Juan and of the Colorado river. This diversion is a case of diversion from one tributary of a stream to another tributary. Both streams finally go into the Colorado.

The ditches at the head of Boulder Creek and Clear Creek divert water from Williams Fork, a tributary of the Grand River and whose waters flow naturally into the Pacific Ocean. These ditches divert Pacific water into Boulder Creek, a tributary of the South Platte, which eventually empties into the Gulf of Mexico. Williams Fork is part of the Grand River watershed, and Boulder Creek a

part of the Platte River system. Clear Creek is a tributary of the South Platte.

The Montezuma Valley enterprise diverts water from the Dolores river by means of a tunnel into Montezuma Valley.

That is a tributary of the San Juan. That ditch and tunnel were built more than 25 years ago and have been in operation during that time.

The Overland Ditch diverts water from Muddy Creek to Laroux; the Highline Ditch diverts water from Surface Creek to Laroux. Now we have a contrary condition prevailing, for a dry creek ditch diverts from the Leroux Creek to a dry creek watershed, that is another instance of the application of that general principle that where the physical conditions were appropriate water was taken across.

The West Cimarron Ditch diverts water from the West Cimarron river to the Uncompagire, which is a similar condition to that of the Cimarron ditch. And so there are many cases of a minor character where no ditch of any size can be built without carrying water at least across certain restricted watersheds.

There is also a ditch at the head of the Arkansas river. There is a ditch at the head of the Mosca, at first diverting water in that case from Sand Creek, a part of the Rio Grande basin, into a part of the Huerfano system flowing into the Arkansas. That has been constructed for at least twenty-five years. Wherever those conditions prevail we find diversions. An inter-watershed diversion in Colorado became the subject of litigation. The case of Collin vs. The Left Hand Irrigation Company. That was in the St. Vrain Valley, where the Left Hand carried water across some of the minor divides. This decision has been the leading case in not only Colorado, but I think a great deal of the west. It is reported in 6 Colorado, 443.

The City of Colorado Springs takes water from the south side of Pikes Peak, carries it through a tunnel of 6000 feet or over and through a secondary tunnel of about 700 feet, and delivers it into a creek on the east side of Pikes Peak, which is then a tributary of the Fountain. Beaver Creek flows south into the Arkansas river, near the town of Florence. This water thus diverted from Beaver Creek is used for all city purposes, including irrigation. This is another example of diversion of water from one tributary for application on the watershed of another tributary of the same stream.

The city of Cripple Creek takes water from one branch of Beaver Creek over into Four Mile Creek, which is not a tributary of Beaver Creek at all. Both Beaver Creek and Four Mile Creek are tributaries of the Arkansas river stream system.

The North Platte and the South Platte are tributaries of the Platte river system.

Inter-watershed diversions within the State of Colorado have all been brought about through the same causes as diversions of water for use from any stream. Simply need of water. Waters have first been taken from streams nearby and later from any other source of supply without discrimination. The same causes

brought about the construction of these canals as led to the construction of canals of this character in France and India.

The present plan of the city and county of Denver, known as the Mountain Tunnel Plan, proposes the bringing of water through a proposed tunnel from the Pacific to the Atlantic side of the watershed. The plans have not been entirely fixed except in a general way, and are pretty well matured. This project would bring water directly for city use and irrigation.

The Henrylyn Irrigation District has in process of construction a similar tunnel. It proposes diverting water from the Williams Fork, which is a tributary of the Grand River for application on lands near Denver and in the South Platte drainage area.

1498 In nearly all of these cases the water diverted is later turned into a natural channel which is used for some distance for the carriage of water before re-diversion. That is the case in a number of these instances mentioned by me in testimony in this case and as shown in several of the exhibits offered. All over the world streams are recognized as the natural and free carriers of water. Wherever conditions are similar, the solutions that the human mind finds are pretty nearly the same.

From the standpoint of irrigation and development I see no difference, unless it possibly be in degree, between diversions from the watershed of drainage of one ocean into the watershed of drainage of another ocean, or of a stream having no outlet, and between tributaries of the same stream. It is a condition that comes from a state of development and a state of need, and local conditions which either make it possible or impossible. Thus, at the head of the Big Thompson, diversion could only be made at great cost and so high up there would not be enough water obtained to justify the expense. At the head of Boulder Creek diversion could be made at a lower elevation and water caught and the expense justified, and the same in Wyoming where diversions can be made when conditions justify it.

Large tunnel enterprises, like the Greeley-Poudre Tunnel, the Henrylyn Tunnel, and the Moffat Tunnel, all in Colorado, represent a stage in the development of the country which justifies bringing

large areas of lands of high value under cultivation to a sufficient extent to pay for those enterprises and justify the expense. Such enterprises bring an additional source of supply directly to the land already irrigated and also directly irrigate an additional supply of land.

On the Eastern Slope we have an almost unlimited supply of land and a limited supply of water. This development is necessary in order to bring under cultivation a larger area of land, increase the crop production, increase the number of people that can be supported or can get their living from agriculture, and increase the aggregate food production. None of these large tunnel enterprises could have been constructed at the time of the construction of the inter-mountain canals of the Water Supply & Storage Company for the reason that they would not have been justified at that time, that is, they were not economically feasible at that time. The value of the land

or increase in the value at that time, would not have justified so large expenditures. That same general fact is shown in the fact that our earlier ditches were possible only because they used cheap construction, wooden headgates, and the most temporary character of construction. At the present date it is possible to use permanent construction. 25 or 30 years ago, irrigated land was, for instance, sold at from \$25.00 to \$30.00 per acre, and the cost of irrigation then per acre was perhaps \$5.00 to \$10.00. In the mean time, these lands have developed to \$100.00, \$200.00 and \$300.00 per acre and a cost of from \$30.00 to even \$75.00 per acre for water is very common and is justifiable now when it was not 25 or 30 years ago. That means then, that an enterprise could be undertaken now that would involve a great deal larger expenditure than a few 1500 years since, and more than that, in all probability, the next 20 years will show corresponding changes as have been in others. Enterprises that today no company could afford to go into and expect to get the money back, in the course of 25 or 30 years will be found perfectly practical. Thus, changes are progressing constantly, and it makes it possible to consider these tunnels and other large expenses today that were utterly out of the question 25, 15, or 10 years ago. You see those conditions in Italy and India, where in some of those cases it took 25 to 50 years of consideration before they actually constructed the plans that had been formulated.

I do not think that these large tunnel inter-watershed diversion projects represent the final development in their immediate neighborhoods. I think we shall see just as much development in the years to come as we have in the past.

The future development will be of this character, or even more expensive, and of course, lands thus can be subject to increased expense or improved service in a great many ways. These tunnel projects would represent the final construction if by so doing they have exhausted the water supply. Other means will be found to economize and the question of economy is a question of expense, whether they can afford to economize and when the conditions are such that they can afford to spend money for that purpose, the water will be stretched. Thus, I might mention, that in Northern 1501 Italy, in the regions of the valley of the Po, they can afford to and do spend as much as \$400.00 per acre in preparing ground for irrigation. That means that it has to be a thickly populated country and lands must be of a high value to justify the consideration of any such construction.

I stated that there is an unlimited supply of irrigable land on the Eastern Slope or great plains region in Colorado. A different condition prevails on the Western Slope. The Rocky Mountains rise abruptly from the plains a little west of Denver running nearly north and south and to the east of that is situated the plains of a very uniform and even surface as a whole; but near the mountains, beginning at the foothills from there for several hundred miles it is a mountainous country, the valleys are narrow, very rarely more than a mile or two miles across, at high elevation and the aggregate



land available for irrigation is small. The land near Montrose has an uncommon expanse, and likewise the San Luis Valley; but in the vicinity of the Gunnison at Grand Junction, the mountain valleys are generally all narrow with very little land subject to irrigation.

The value of irrigated lands in the high mountain regions and in cold climates is very much less than the value of the land on the plains situated at lower elevations. At higher elevations the land is practically confined to hay. It has cold climate, not because of latitude, but because of elevation, which makes really the climate conditions about the same as if the land had been about 1000 miles further north. It is a very fine hay country but can grow only crops than can stand the Arctic climate of that elevation.

1502 The production on these two classes of lands can hardly be compared. That is, the production, for instance, at the elevation of Denver or Greeley, Colorado, about 5000 feet, now runs from \$100 to even more per acre per annum. \$50.00 and above would indicate a great portion of the production per acre of that area, whether it be wheat, beets or potatoes. This production can be increased by the cultivating of cabbage, onions and like crops to several hundred dollars per acre. There is a record strawberry crop that ran over \$2000 per acre; but of course those are not under really typical conditions.

At higher elevations of seven, eight or nine thousand feet, the conditions vary somewhat according to the locality and climatic conditions. Thus, for instance, the San Luis Valley has an elevation of over 7000 feet, but is at the south edge of Colorado and is protected on the north side from winds, and grain grows there very successfully. If it were open to the north winds, the climatic conditions would be very different even at the same altitude. Now, as we go north, they have a region adapted only to the growing of hay, and as we go further north into North Park and also the Laramie basin, the same condition prevails. The Laramie basin has an elevation of about 7000 feet. It is open to cold winds of the north, without protection of a mountain range on the north side, and in addition to that, it is situated so that the storm centers, or at least a great many of them, pass to the south, and that gives it a pretty cold bath of air, and gives it the conditions that make it more Arctic than the elevation itself would.

1503 Inter-mountain and inter-watershed diversions prevail in Wyoming. Wyoming is an arid state where irrigation is practiced under irrigation conditions and is therefore subject to the same general modes of action as other states and other countries. With Wyoming, as with Colorado, Italy, India and France, wherever there has been a locality developing which needed water, they have obtained water either from the adjacent stream or from an available foreign watershed. There are quite a number of instances of this kind in Wyoming.

The most marked instance is in Northern Wyoming which might be mentioned in detail, in the vicinity of Sheridan, and is very marked for a double reason, for its development has been to a greater

degree than anywhere else and the marked conditions there have developed more than anywhere else that I know of in the State. In the first place, the land is at a low elevation, comparatively speaking, and that means that agriculture is more of an agricultural than of a grazing character. The land then justifies higher prices and more extensive development. That is the first condition. For a second reason there also happen to be physical conditions near there encouraging the diversion of water quite rapidly at one particular place. This has led to an extensive series of diversions from one watershed to another. Those diversions have been recognized by the State of Wyoming by permits given by the officers in charge of irrigation. They have also been recognized by the Board of Control in giving the adjudicated rights. Those 1504 adjudicated rights are similar to what we call water rights in this country. They are given by the Board of Control. In Colorado they are fixed by the courts. They are identically the same.

Wyoming has officially recognized all of these transfers and use of water from one shed into another, and this particular place is the pioneer almost, in Wyoming, for the two reasons already given, and also for the reason that that portion of Wyoming has been one of the earliest to develop an agricultural community. The vicinity of Buffalo and Sheridan, was one of the first in that state to become an agricultural community, hence those conditions developed there more than anywhere else in the state.

When I speak of agriculture, I am distinguishing between that and what I call pastoral. I refer to conditions where the cultivation of crops prevails. They may, of course, grow hay, as they do to some extent, as well as cultivated crops.

The elevation at Sheridan is 3,750 feet, while the elevation at Laramie is over 7000 feet. Thus it makes that northern border a portion of the best agricultural section of the state from an economic standpoint.

There is a very extensive series of transfers of water from one watershed to another on the various tributaries of the Powder river, which are south of Sheridan connected by a good many of the tributaries. The ones I refer to as the most marked ones, are those where water is transferred from a branch of the Powder river over to a branch of the Tongue river. These two streams are entirely independent, both in Wyoming and Montana, except as they physically mingle their waters as they enter the Yellowstone river.

1505 The Powder river and the Tongue river in Wyoming are very similar in their general situation to the North Fork and the South Fork of the Platte river. These two streams are entirely separate in what might be called the parent state. After passing out of the parent state into another state, they then both enter into another stream and finally join their waters there. In this case, the Tongue and Powder rivers join their waters in the Yellowstone. In the case of the Laramie and the Poudre rivers, they join their waters by a junction of the North and South Platte

ivers in Nebraska. Both the Laramie river and the Poudre river are Colorado streams and their waters intermingle in another state.

(Defendants' Exhibit 46 offered in evidence.)

Exhibit 46 is a map prepared by me and under my direction. It shows the states of Colorado, Wyoming and Montana and some of the adjacent territory of the adjacent states and shows the Powder and Tongue rivers, their course in Montana and their junction with the Yellowstone and also shows by broken lines the alignments of their watersheds. It also shows the Laramie river and the Poudre and the South Platte streams and their course at their Junction in Nebraska, as well as in Colorado and Wyoming.

The diversions at Sheridan, Wyoming, are exactly parallel to the diversions from the Laramie river to the Poudre river in Colorado. The diversion from the Powder into the Tongue, is made in Wyoming, while the two streams pass through another state.

I had started to speak of the diversions in the Powder 1506 watershed before speaking of its diversion into the Tongue river watershed. The Powder river watershed is just south of the Tongue river. In that watershed is the town of Buffalo and the irrigated section adjacent. Lake De Smet is in that watershed. On the west side are the high mountains which supply these streams, and these streams as a whole are more abundant in the Powder river watershed, apparently, than just north of that tributary to Sheridan.

In these streams coming down from the watershed on the Powder river, there have been a large number of diversions from one stream to another. For instance there is a diversion from Clear Creek over into French Creek, and from French Creek into Johnson Creek. These streams I mention are tributaries of the Powder river, and the next, however, are also of the Powder river east. I am taking the transfer of water from one watershed to another of branches in the Powder river stream system. There is also found a diversion that passed from French Creek into Johnson Creek or across Johnson Creek. We likewise have a diversion from Piney Creek on the North to Shell Creek on the south; and also from Rock Creek over to Shell Creek. There is also a place in the mountains some ten or twelve miles west from there, where the South Piney Creek and Rock Creek come close together. That then affords a convenient opportunity to divert water from the South Piney over into Rock Creek.

Such diversions have been made, have been practiced for years, and that whole irrigated tract is itself interlaced with the use of water from one stream to another. The decrees or adjudicated rights have been made from one stream to another according to the original source of supply irrespective of the original location of the land. Now so far mentioned, these diversions are all in the Powder river watershed, the most southerly of these two streams, the Powder and Tongue. Then I refer to the diversion from the Powder over to the Tongue river watershed.

(Defendants' Exhibit 47 offered in evidence.)

Exhibit 47 is a sketch map showing the stream system in northern Wyoming both of the Tongue and of the Powder rivers. It shows these various points where water crosses from one stream to another, and these particular points are marked by a cross. The land which it supplies by water through transfer is marked by crossed lines. I might say that the extent of these cross lines does not indicate very accurately the land itself, but indicates its location in a general way. It also shows the principal ditches simply taking the outside ones, or typical ones that cross the Divide. It does not extend beyond the Montana Border. There is however, in the corner, a map on a small scale that shows its relation to Montana, and the Yellowstone river, showing the general situation on a very much reduced scale.

Exhibit 47 shows the various diversions I have just testified about, that is, those taking water from one portion of the Powder watershed to another. This map was prepared by me or under my direction.

1508 Discussing the diversions between the Powder river and the Tongue river, I will state that there happens to be a very convenient place for diversion between those two watersheds. There is a ridge of rock or rampart between the two sheds; but at one particular place it is broken so that there is a gap very much lower than the summit of the ridge. At the same place a tributary of the Powder river comes very close to the opening, so it required very little work to divert water through that opening. On the north side, that is, the Tongue river side, the water course, a branch of the Prairie Dog, descends very rapidly, so that the country on the north side of that gap is lower than on the south side. This gap has been a noticeable landmark in a sense, and so much so that the early travelers and wagon trains went through the gap and made it a point of crossing through this ridge. That gives the physical conditions for these diversions.

Then, in addition to that, we have the relative fall of the land to the north and the relative early development of that same region make additional water desirable. Hence it was the most natural thing in the world and a consequence of that same general law, that they made a diversion through this gap. In doing this they took water from North Piney Creek which is a branch near the gap; but as the North Piney is not as good a stream as the South Piney which is more or less east and to the south, they then in addition, constructed feeding canals from the South Piney to the North Piney and bring water from the North Piney through this gap into the

Prairie Dog Creek on that watershed. Prairie Dog Creek is used to some extent as a carrier of this water. They use both ditches and the Prairie Dog Creek for this purpose.

Permits and decrees were given for these diversions by the State Engineer, and by the Board of Control. These permits are given to the waters of Piney Creek and the lands are described as lands along the Prairie Dog or other streams to the north. These streams are tributaries of the Tongue river, that is, they are part of the Tongue

river stream system. The Piney is a part of the Powder river stream system.

The rights to this water, as given in the state records of Wyoming, are classed in with the Piney Creek, and except by looking up the specific lands, it would not be revealed that the water was carried across the shed. In this particular case, the list of lands that have thus acquired rights has been platted on the topographical sheet and shown here in color.

(Defendants' Exhibit 48 offered in evidence)

Exhibit 48 is a map prepared on the Sheridan Quadrangle sheet of the United States Geological Survey with additional notations. These notations were made under my direction and show in color the lands on the Tongue river watershed that are supplied by water from Piney Creek of the Powder river watershed. These are the lands to which water has been decreed by the Board of Control of the State of Wyoming. That body consists of the State Engineer and the division superintendents, and is the official body of the State to issue permits to water. In addition, there is noted on this map the divide between the two streams in heavier ink so as to indicate clearly where that watershed is by the broken line. The

1510 ditches are not indicated in my notations. They are shown on the map by a blue line corresponding to the stream. There are three or four colors used which indicate the course given of respective ditches through this gap. The coloring was done by me. There is a legend on the map showing what each color signifies.

There are some diversions in the same general vicinity in addition to the diversions I have noted on this map, that is, from the Tongue river itself, or Tongue river system, from one stream to another, so that there are quite a number of diversions of similar character to those referred to in the Powder river watershed. It simply is a general practice there, and the conditions as mentioned are very favorable to such diversions, and consequently they have done there, as everywhere else on the earth's surface when the occasion justified it. They have carried water from one stream to another, as freely as if no sheds were there, and the only conditions to be considered, physical and economical. These on the map are represented as in the case of the Powder stream system, by crosses at the point where the principal diversions are made across the sheds. It is not an exhaustive list. There are some others in the extreme north and west of this map that are not shown here.

1511 I was compelled to check the lands as fixed by the Board of Control decrees in order to ascertain which of these diversions from Piney Creek and the Powder river tributaries were inter-watershed in their nature. The published list of adjudicated rights, published by the State, simply tells the name of the ditch. For instance, the Prairie Dog or Supply Company, and puts it under Piney Creek, but gives no indication in that as to where the land is located. That requires then a list of lands in detail which are not in the published list.

There are several other instances of inter-watershed diversions in

Wyoming that I know of and undoubtedly there are many that are arising, because wherever the conditions justify, such diversions are the natural consequence.

The diversion by the Wheatland project out of the Laramie river, known as the Wyoming Development Company's tunnel, is an inter-watershed diversion. Water is taken from the Laramie river by a tunnel into Blue Grass Creek, and going over into the Sybille watershed, which also is a tributary finally of the Laramie. It is a diversion from the main stream across into the shed of tributaries in that case.

The difference between the diversion of the Wyoming Development Company and the diversion between the headwaters of the Laramie and Poudre is one of degree only. The two streams come close together and the diversions would undoubtedly have been made just as freely if the Sybille had not entered the Laramie river at all. It does enter the Laramie river, but I have no doubt from the knowledge of the mind of the people who developed irrigation enterprise, and the people who farm and need water, that those people would have diverted water just as quickly, and just as freely, and believing that it was perfectly right and proper, as the western person does anyway, whether the Blue Grass had gone into the Sybille and then into the Laramie, or whether it had gone in the other direction. In other words, it is just as natural to take water when available there, as it is for a hungry man to search for food.

Had the Wheatland people not made the inter-watershed diversion by means of a tunnel, they could not have developed the Wheatland area, except to a limited extent. That diversion has rendered the whole Wheatland tract possible from an agricultural standpoint.

The only difference between the diversion at issue in the case now on trial and the diversion of the Wyoming Development Company from the Laramie to the Blue Grass is that of degree, and that the streams come together again quicker in one case than in the other. Had the Wyoming Development Company's tunnel not been constructed, the water of the Laramie river would have gone on into the North Platte.

The diversion by the Wyoming Development Company is recognized in Wyoming. That is the same diversion concerning which Mr. Johnson and other witnesses have heretofore testified. The courts and officials have recognized it, permits have been granted, the Board of Control has adjudicated it, but it is in the general list which has been subject to appeal, so that I think the final decree has not been rendered. I am not aware of any objection having been raised to this diversion on account of it being inter-watershed in character. I have never heard any suggested.

There is a diversion under construction in Wyoming, where water is proposed to be taken from the North Platte river and brought over into the Little Laramie river, or a branch of the Little Laramie, by the Laramie Water Company, which system includes the Lake Hattie reservoir and the Pioneer Canal, which has been referred to



in evidence in this case. Water is to be taken from Douglas Creek, a part of the North Platte system and brought into the Little Laramie, or one of its tributaries, and thus taken from the North Platte river and supplies the Laramie river or Little Laramie. It runs from the Little Laramie into Lake Hattie, by means of a supply canal tapping the Little Laramie, which is constructed.

If the waters of Douglas Creek were not intercepted and were allowed to flow as naturally, they would go into the North Platte river and into the Pathfinder reservoir. This is the same ditch concerning which Mr. Bishop, as engineer for the Laramie Water Company, testified. It is the same ditch sometimes known as 1514 Douglas Creek Ditch and testified to by other engineers, who were witnesses for Wyoming and employees of the Laramie Water Company.

It is a fact that one of the complaining parties in this suit is doing the very thing of which they complain. The same fact is true with relation to the Wheatland or Wyoming Development Company's project.

Examination by Mr. Delph E. Carpenter:

1515 Speaking further of the State of Wyoming and its recognition and adoption of the custom of inter-watershed diversion and application, I have found several references and plans of such proposed diversion from one stream to another, where maps have been presented and referred to in the State Engineer's reports.

(Defendants' Exhibit 49 offered in evidence.)

Exhibit 49 is reproductions of sketch maps in the reports of the State Engineer of Wyoming, showing proposed diversions from one stream to another. There are three of them, I think there are two or three different reports. These three sketch maps shown in Exhibit 49 are all from one of the State Engineer's reports of the State of Wyoming, that is from the 7th Biennial Report. The one taken from page 40 represents the Encampment Canal in the Platte river drainage basin, and its proposed route crosses several other tributaries of the Platte river system. From page 39 of the same

1516 7th report is a proposed Basin Canal from the Grey Bull river, and crosses the divide between Grey Bull and the Big Horn, passing over the divide and dropping into the Dry Cottonwood, supplying some of the valley in the vicinity of Basin. There are several other minor canals shown, noting proposed developments that are not inter-stream. On page 44 of the same report is also shown a diversion proposed from the Shoshone river across the divide into the watershed of the Grey Bull, and there are some ditches taking from the Shoshone river to the north, running into the minor watersheds.

There are probably a large number of inter-watershed diversions or inter-stream diversions varying only in quantity and degree, through Wyoming. I have not looked up all those places where conditions are favorable; but where conditions are favorable they are apt to be found.

I understand that one of the issues in the case now on trial, is the right of the defendants to divert water from the Laramie river watershed to the Poudre watershed. I have ascertained that the appropriators of Wyoming divert water from the Poudre river over into the Laramie river. There is a case where water is diverted just in the contrary direction to that proposed by the State of Colorado and the Greeley-Poudre system, where water is diverted from a tributary of the Poudre river by systems in Wyoming, into a tributary of the Laramie, or from the Poudre watershed into the Laramie watershed.

This diversion takes place in Wyoming under the sanction of the laws and regulations of Wyoming. It is done in accordance with the permit of the State, and by the rights which have been passed on and adjudicated by the official Board of Control.

(Defendants' Exhibit 50 offered in evidence.)

Exhibit 50 is a map prepared by the State Engineer's office of Wyoming of township 12 north, range 73 west, or a portion of that township, the southern boundary of this portion being the state line between Colorado and Wyoming. This is one of a series of maps prepared by the State Engineer's Office of Wyoming, showing ditches and streams from which ditches have been taken in that state for the purpose of record in their office. They have a series of such maps covering most of the State where ditches have been built and rights have been recognized. This, then, that I present, is the official map from their office, except that for clearness in this case, I have marked over the streams and ditches in color to make it more distinct. The streams are designed with red and the ditches with yellow. This was done to make them clearer and as this is a blue print the lines are not very clear.

The Johnson ditch crosses the Divide from Fish Creek, which is a branch of Dale Creek in the Poudre River watershed, and over into the willow Creek drainage area, which is a part of the Laramie watershed. The Hill ditch, also apparently crosses the Divide and is not so clearly marked. These diversions are of a minor character, compared with the larger ones of which I have spoken. They are small as to the amount of acreage, but they involve the same principle. The Fish Creek is a small stream running into Colorado but having a good many diversions from it in Wyoming.

(Defendants' Exhibit- 22 to 50 inclusive introduced in evidence.)

I have covered a number of examples of inter-watershed diversions on both Hemispheres; situated in several countries and several states of the United States. As I have before stated, they are illustrations of the fact that when water is needed for agriculture, they are going to, or inclined to divert that water for that purpose whether it be from a stream adjacent or from a greater distance, and by a direct diversion or the intermediate use of reservoirs, but in all cases, the diversion is actuated by the need and the opportunities to use that water. That the fact of passing a watershed seems in no case to be of any more than a question of physical diffi-

culty. That it is done as freely from one stream or a neighboring stream if the physical conditions permit and justify it. It has been recognized by practice and custom as a proper and necessary thing to do. In each instance the object is to obtain water for irrigation of land, and in some cases for domestic use. Practically all the cases I have given have been for irrigation, at least that has been a very important part of the purpose.

There is no essential difference between the use of open ditches or of tunnels for the purpose of making this interwatershed diversion. They are both means adapted to local conditions and accomplish the same general purpose. The selection of either of these means is merely an engineering problem.

I have already spoken of certain variances of land values from crop production. I will speak further on that in subsequent testimony. I merely mentioned it as incidental to interwatershed diversions at this time.

1520 Cross-examination by Mr. John D. Clark:

Most of the irrigation works in India referred to are public works, those in northern India being Government projects. It is not true that the only sovereignty interested is the Government of India, for there are a number of independent projects there, while the reservoir of the Pereyar project is in the Travancore, which is a state not at all under British jurisdiction. The topography

1521 of northern India in which the Jumna diversion occurs is as follows: The united valleys of the Indus and Ganges may be spoken of as a transverse valley across upper India, the distance from the Arabian Sea to the Bay of Bengal being about sixteen hundred to two thousand miles. The valley then spreads from the Himalayas on the north to the central mass of mountains called the Ghatz, and so the transverse valley extends practically clear across the peninsula. The irrigated area from these sources is limited on the south by the Ghatz Mountains.

1522 On the divide between the Indus and the Ganges the precipitation runs something like from fifteen to twenty inches, I believe, and in both cases they are affected by the monsoons. In the western region as you pass down below the Punjab, at the mouth of the Indus, there is very slight rainfall, five or ten inches. That is below the region which I have mentioned in my testimony here, however, as being under the canals that have been described. Toward the divide this annual precipitation increases to an average of about fifteen to twenty inches on the divide. At or near Delhi, it increases very rapidly up into the Himalaya Mountains. As you pass eastward down the Ganges, the rainfall is increasing constantly even as far as the mouth of the stream where the annual precipitation is in the neighborhood of 75 inches; but that is outside of the provinces of Agra and Oudh where irrigation is practiced to such a great extent, and furthermore this is an annual rainfall and not a distributed rainfall, that is, it does not indicate the distribution for the agricultural season. In the Himalayas, as we ascend, the precipitation

rapidly increases as a whole, the high limits running as high as 75 inches, and then drops off as you pass and even before we get through the Himalayas. That is because of the fact that the prevailing winds strike the mountains and drop most of the moisture on the other side before it reaches the summit. The smallest annual precipitation in the Ganges basin is at the Jumna near Delhi, being 25 inches. The precipitation in the provinces of Agra and Oudh ranges from 25 inches at the river to 60 inches in the mountains, 40 inches being the precipitation near Allahbad and Lucknow.

1523 Part of the irrigation in the Ganges basin is in this territory, and the balance is above where the precipitation is 50 inches or more per annum. The greater part of the precipitation occurs during the south-west monsoon between June and October. The precipitation in the portion of the Indus basin irrigated from the Ganges ranges from 15 to 30 inches, the average being about 20 inches. Some portions of the Rajputana, with a precipitation of 10 inches and less is irrigated from the Ganges, but this is not a British project.

1524 The Western Jumna Canal is intended to divert about 3,000 cubic feet per second. There are discharge measurements of the Jumna ranging from 2128 second feet to 145,000 second feet, but average discharge records are not available. Jackson gives a mean discharge record for the Ganges at Benares of 250,000 second feet. Both the Ganges and Indus are very large

1525 streams. Although I had in mind in reading the several authorities on the matter, complaints arising from these inter-stream diversions, I found no mention of any such complaint. The diversion in which the Indus basin was concerned did interfere with desired utilization of water in the Ganges basin itself, and required the construction of canals diverting water from the Sardah and Hindan rivers within the Ganges basin to furnish a supply to canals from the Ganges which were affected by the upper diversion of that stream into the Indus basin. The Western Jumna Canal is in the Punjab, and the Agra Canal is in Agra and Oudh. I do not know whether the entire territory affected was under a single political control when the Western Jumna Canal was originally commenced in the 12th century.

1526 The diversions shown upon Exhibit 23 relate to different tributaries of the Indus River, and those shown upon Exhibit 24 relate to different tributaries of the Ganges River, and all shown in Exhibit 24 excepting the Western Jumna Canal are in the united provinces of Agra and Oudh.

1528 The Western Jumna Canal has one branch irrigating land within the Ganges basin, and extending to Delhi. The mountain range dividing the lower portion of the Indian Peninsula is quite close to the western coast, and the precipitation between the mountains and the coast is extremely high, ranging from 75 inches to more than 100 inches at the summit of the watershed. There is irrigation practiced at some places on this western slope. I do not know whether there is an abundance of water upon the western slope for the required irrigation or whether the diversion to the eastern

slope by the Periyar interferes in any manner with such irrigation, but the British have agreed to pay to Travancore \$20,000 per year in connection with their utilization of the water for the eastern slope. The precipitation upon the eastern slope varies from 25 inches to more than 30 inches.

1529 The Kurnool shown upon Exhibit 26 is entirely within the Madras presidency, and the two rivers affected reach the ocean in the same political subdivision.

The French canals shown on Exhibit 27 were originally private projects. The Verdon and Marseilles canals are municipal projects. The private canals were constructed by public authority. The recent extension of the Carpentras Canal was built in 1850, and the Alpine Canal a little while before that. They take nearly all the water of the Durance River in low stages, and have been the means of developing an extensive territory north of Marseilles which would otherwise be practically a desert.

1531 The diversions from the Durance have not affected the agricultural development of lands in the valley of the Rhone below its confluence with the Durance, and I do not know whether such diversions have affected the irrigation of lands along the lower part of the Durance. The land to the north of the Durance toward Avignon is cultivated and is extremely valuable, a large part of the water used in that region coming from the Vaucluse and other streams above the Durance. I am not certain whether the agricultural development of the lands to the south of the Durance has been very great. All of these streams and territories affected by these diversions are within the same sovereignty, but I do not know whether that was true when they were constructed.

1532 The Carpentras Canal irrigates some lands within the Durance watershed and all lands irrigated from it are within the French area of the Rhone, of which the Durance is a tributary, and the diversion by the Carpentras has not injuriously affected the irrigation of lands within the Durance basin, and the return waters reach the Rhone River just as certainly as though the canal had been entirely within the Durance watershed, and all of the lands, rivers and canals are within the French jurisdiction.

#### Examination by Mr. Delph E. Carpenter:

In yesterday's testimony I made one or two errors which I desire to correct. The Alpine canal was built in 1875, and not in 1850. I was unable to answer with regard to the quantity of water taken from the Durance, that is the quantity the Carpentras Canals and the Marseilles Canals were taking out. I think the question was as to whether they did not leave quite a large part of the water of the streams. I have with me the figures covering a number of years. The appropriations for those various canals are 98 cubic meters per second, that is, in low water. That is a little more than 3000 cubic feet of water per second. In 1868, the minimum flow of the Durance was 67 cubic meters. In 1869, 47.7; in 1870, 42.95; in 1871, 55.9; in 1872, 56.8; in 1873, 73; in 1874, 55.3; in 1875,

56.5; in 1876, 61.3; in 1877, 60.2; and so on to 1884, all being less than the sums of their appropriations, except in 1881, which is 119. So that the stream runs down to less than the appropriations. That data is taken from the official publication of the French Government published under the Division of Agricultural Hydraulics, 1535 and those particular facts are given in the Fascicle E.

Cross-examination by Mr. John D. Clark:

1535 The combined proportions of the Carpentras and Marseilles Canals is 98 cubic metres per second or about 3,000 second feet, and this quantity exceeds the amount in the Durance River at low water in each year from 1868 to 1884 excepting in the year 1881. The low water periods tend to occur in the winter months. I have no record of the mean flow of the stream, but it runs very high at flood periods. The Rhone River is more stable and is used for commercial purposes.

1536 Exhibit 29 relates to a diversion of the Drac River, a tributary of the Isere, which is a tributary of the Rhone, and the diversion is into the watershed of the Durance which is likewise a tributary of the Rhone, and all of these diversions occur in the same country.

1537 I cannot state whether there is any irrigation in the valley of the Drac. The entire country in this region is in a high state of development from an agricultural standpoint where the land is suitable. I do not know of any desired development which has been effected by this diversion from the Drac. The canal from the Drac is a private enterprise subsidized by the Government.

1538 The Cavour Canal from the Po River was started by a private company, but was completed by the Government. It serves land entirely within the watershed of the Po, and is considered an example of inter-watershed diversion, because it crosses several subsidiary watersheds of tributaries of the Po. The principal

1539 function of the Cavour Canal is to supplement the supply from other sources of many hundreds of large and small ditches between the canal and the river. The only minor watershed

1539 from which the Cavour Canal diverts water is of the Dora Baltea, which is a better stream than the Po, and has an immense flow from the glaciers and Swiss lakes. All that

1540 portion of the watershed of the Dora Baltea which is affected by the Cavour Canal diversion is irrigated from the Cavour Canal and from the Dora Baltea, and the lands within the watershed of the Dora Baltea are not injured by the Cavour diversion.

1541 The Villa Reisi Canal is a private enterprise constructed under a concession from the Italian Government and diverting water from the Ticino, a tributary of the Po, and carrying the water in an easterly direction across two or three other tributaries of the Po, all of the land irrigated being within the basin of the Po.

The lower portion of the valley of the Ticino below the 1542 Villa Reisi Canal is very well irrigated and the canals serving it are prior in point of time to the appropriation of the



Villa Reisi Canal, so far as I know, and no potential agricultural development of the lower valley of the Ticino is interfered with by the construction of the Villa Reisi.

1543 The great value of the lands along the Villa Reisi and Cavour canals is due to their use for raising hay for cattle, which are not pastured upon the land, but are fed with the grass cut with scythes and taken in to the animals. The value of such lands exceeds that of the wheat and corn lands. The land so used can produce grass both winter and summer, and a great many cuttings are had in the course of a year.

1544 The proposed diversion from the Blue Nile in Egypt is into the watershed of the main Nile, to which the Blue Nile is a tributary. The Blue Nile traverses the country which is largely non-irrigable on account of the topographical conditions, but I think a portion at least of the watercourse is across a broad flat. I cannot say whether the proposed diversion, if made, would in any manner affect the potential development of the Valley of the Blue

1545 Nile. The whole project involves country within the jurisdiction of Egypt. The diversion I have described in British Columbia is from the Columbia River into the Kootenay River watershed. Both of these streams enter the State of Washington where the Kootenay flows into the Columbia, which is a large river with sufficient water for all irrigation purposes.

1546 The several projects in the province of Alberta other than that shown in Exhibit 37 are contemplated diversions from one tributary of the Saskatchewan into another tributary of the same river, all within the same province, and the two minor watersheds in each case uniting in Alberta. At least up to this time they have not interfered with irrigation development below the points of diversion.

1547 The project shown upon Exhibit 37 has not been constructed. It is proposed to divert water from the White Mud River, a tributary of the Milk River, which belongs to the Missouri River system, into a tributary of the Saskatchewan. I do not know whether it has been a subject of international agreement, nor whether it is connected with the international agreement relative to the St. Mary's-Milk River project.

1548 This international agreement was required by the United States because the Milk River flows back into Canada, and without the agreement there was no certainty that the water carried into that river from the St. Mary's would be permitted to re-enter the United States. On Canada's part it was not considered that any agreement was necessary.

The project shown on Exhibit 38 has not been constructed, but is contemplated by the central government of Canada, which has jurisdiction over such matters in the province of Alberta wherein

1549 all of the lands and rivers affected lie.

Exhibit No. 39 shows a project diverting water from the Red Deer River into the Rosebud River, both being tributaries of the same stream and both watersheds uniting in the same province where the diversions occur. Some of the system has been constructed

by the Canadian Pacific Railway under authority of the central government which has jurisdiction over the lands.

1550 Irrigation along the Red River is comparatively new and has not progressed to any great extent.

1551 Exhibit 43 shows the Strawberry valley project of the Federal Reclamation Service, which is 69% completed. The diversion is from Strawberry Creek, which belongs to the Colorado River system, and to which the Grand River also belongs.

1553 The diversion carries water into the interior basin of Utah. Strawberry Creek and the other small creeks supplying the reservoir for this project constitute but a small portion of the Grand River system, and the Grand River itself is but one of several large tributaries to the Colorado River. The diversion occurs in Utah where the lands irrigated are also situated, and does not directly affect the State of Colorado, excepting that there has been some intimation that Colorado might be called on to furnish water lower down on the Colorado River, in which event the Strawberry Creek diversion might affect the Colorado interests.

1554 Suggestion that Colorado might be indirectly affected by this diversion first brought to mind by correspondence that I saw some years ago from some minor government employee, in which he spoke of fact that there might be some need of water from Colorado to irrigate land in southern California and in which he intimated that certain rights through government forests in Colorado might be held up on that account. That is the first time such a thing was suggested or considered possible. I do not believe most people of Colorado have been aware of possibility of claim from the lower portion of the Colorado River. It would seem preposterous to them.

The Strawberry Creek enters the Green River above its junction with the Grand River to form the Colorado River, this junction occurring within Utah, where this project has been constructed.

1555 The Colorado River enters a canyon shortly below the junction of the Grand and Green Rivers, and emerges from the canyon on the border between California and Arizona, and the principal irrigation project below that point is in the Imperial Valley, and has been completed for several years, during

1556 which period the lands under it have been under irrigation.

In addition to that project there is one undertaken by the Reclamation Service in Arizona on the east side of the river. These two projects do not exhaust the irrigable lands at the lower end of the Colorado River. The diversion through the Strawberry project is a very small part of the total flow of the Colorado River.

1557 Some officers of the Reclamation Service have suggested that diversions from the Grand River in Colorado and on the Green River in Wyoming might be injurious to the Reclamation Service project on the lower Colorado River, and it has been a contention of Colorado officials that the stream flow in the Grand River has been more than ample for any possible use upon the

western slope. While I was State Engineer, the question of the possible effect upon irrigation of the western slope of Colorado of trans-mountain diversions from the Grand River was never presented in such form, although such diversions were in consideration and were considered perfectly proper, the question of conflict being only the same as in the case of any other diversion.

1560 So far as I know it has never been necessary to determine the adequacy of the Grand River for present irrigation purposes. The western slope in Colorado contains little land susceptible of irrigation as compared with the acreage in the watershed. Such of the Grand Valley as is available is now pretty well irrigated, and there are a number of ditches near Grand Junction, and a considerable added acreage can be irrigated. In my opinion there is an ample supply of water for the present irrigation systems in that country, with proper storage and economy. I have no additional data upon which to change the computation of C. W. Beach and P. J. Preston that the annual stream flow of the Grand River at Palisade is 3,378,000 acre feet. This point of measurement is thirty miles above the state line and ten miles above Grand Junction, and is above some of the large canals and also above the mouth of the Gunnison River, which has a large annual flow.

The Government project which I have described diverting the water from the Gunnison River, carries it into the Uncompaghere River, which is a tributary of the Gunnison itself. The diversion occurs in the State of Colorado and the Uncompaghere enters the Gunnison River within the State of Colorado. As state engineer I required the Reclamation Service to file in my office the proper maps for this project and to follow the local laws and regulations.

1561 The diversion from the Dolores River into the Montezuma Valley was made by private enterprise in 1887. Prior to that time the users from the Dolores River had complained of shortage of water, and they thought that the diversion intensified this situation, but I do not know whether the latter is true. The diversion was never objected to by the State of Colorado. The Dolores River is a tributary of the Grand River, and the stream into which the diversion is made is a direct tributary of the Colorado, although the latter stream enters the Colorado near the southern boundary line of Utah, a long distance from the point where the Dolores River enters the Grand River, a few miles inside the eastern boundary of Utah. I do not know whether there is

any irrigation from the Dolores River in Utah. The proposed Henrylyn Tunnel diverting water from the western slope to the eastern slope of Colorado is a part of a much larger system upon which a great deal of money has been expended. Some work was done on the tunnel till the Forest Service, which had not approved the application for right-of-way, made objection and the work was stopped. I cannot say definitely whether any objection was made to the Henrylyn Tunnel by any Government bureau on the ground of its effect upon irrigation from the Colo-

rado River, but there has been some kind of indefinite objection.

1563 The diversion from the Grand River into the Poudre, which I have mentioned, is by a ditch of considerable size, being from twelve to fifteen feet wide, and carrying from four to six feet of water in depth. The annual flow through the ditch has been some place around 12,000 acre feet. All of the diversions from the Grand River into the South Platte basin are relatively small, being at high elevation and intercepting a small proportion of the watershed at a point several hundred miles above the point where the Grand River leaves the State of Colorado, and intercepting the water from a few of its tributaries.

1564 Exhibit 44 relates to a Reclamation Service project in Montana, where water is diverted from St. Mary's River in the Hudson Bay drainage into the Milk River within the Missouri River drainage, and the project was 18% completed in May, 1913. The international agreement relating to this project was desired, I believe, by the Reclamation Service to insure the water remaining in the Milk River where the same flows through Canada between the point it receives water from the St. Mary's River and the point it re-enters the United States, and its purpose was not to secure the right to divert the water from St. Mary's into a different basin.

1565 This international agreement was that signed January 11, 1909, and proclaimed May 13, 1910, reading in part as follows: "The St. Mary and Milk rivers and their tributaries in the State of Montana and the provinces of Alberta and Saskatchewan are to be treated as one stream for the purposes of irrigation and power, and the waters thereof shall be apportioned equally between the two countries, but in making such equal apportionment more than half may be taken from one river and less than half from the other by either country so as to afford a more beneficial use to each. It is further agreed that in the division of such waters during the irrigation season, between the 1st of April and the 31st of October, inclusive, annually, the United States is entitled to a prior appropriation of 500 cubic feet per second of the waters of the Milk River, or so much of such amount as constitutes three-fourths of its natural flow, and that Canada is entitled to a prior appropriation of 500 cubic feet per second of St. Mary's River, or so much of such amount as constitutes three-fourths of its natural flow.

The channel of the Milk River in Canada may be used at the convenience of the United States for the conveyance, while passing through Canadian territory, of waters diverted from the St. Mary River.

The measurement and apportionment of the water to be used by each country shall from time to time be made jointly by properly constituted reclamation officers of the United States and the properly constituted officers of his Majesty under the direction of the International Joint Commission."

1566 Of course the United States had to make some concessions to Canada, whose citizens made some complaint when this project was proposed.

Exhibit 45 shows the plan of the Los Angeles aqueduct, diverting water from the Owens River, which is a tributary of Owens Lake, lying within the interior basin. Both Owens River and Owens Lake are situated in the State of California. I do not know whether the state gave express authority to the City of Los Angeles to construct this aqueduct. The aqueduct was undoubtedly constructed for municipal purposes and would probably never have been built for irrigation purposes on account of the large expense, but I do not know whether the proposed irrigation from this project is merely temporary, under special permit, or whether it is permanent. While this diversion could have no effect on any diversion from the Owens River excepting one between the aqueduct and Owens Lake, I do not believe it is correct to say that the only land affected by the diversion is that lying along Owens River between the point of diversion and the Lake for it would be possible, as was here done, to construct canals from the Owens River around the lake. I do not know whether the city, in order to effect this construction, purchased the privately owned lands along the Owens River, nor do I know whether the land other than a small acreage adjacent to the river is public land embraced within the Federal Forest Reserves; nor do I know whether there is any land in private ownership which can be affected by the aqueduct.

1567 Exhibits 46, 47 and 48 relate to inter-stream diversions between the Tongue and Powder Rivers in Wyoming. I have never been over these diversions personally, and have no acquaintance with the topography of the lands in the watersheds of these two rivers in the State of Montana, nor do I know whether there is any irrigation from either of these rivers within that state. Both streams enter Montana and flow into the Yellowstone River in that state. The principal part of the watershed of the Tongue River is in Montana and the larger part of the watershed of the Powder River is in Wyoming. The diversions from the Powder River into the Tongue River occur about twenty-five miles from the Montana line. The diversions shown upon Exhibit 47 in Township 53, Range 83, in reality consist of three separate ditches carrying water from the Powder River drainage into the Tongue River drainage, and are as old as any ditches in that part of Wyoming, being constructed before 1888, I believe. I am unable to state how much water is carried from one watershed to the other, but the acreage irrigated by these diversions would aggregate nearly 10,000 acres, and it is not my information that any part of this acreage is supplied with water other than that taken across the divide. Piney Creek, from which the diversions are made, is but one of several tributaries of the Powder River in Wyoming, but I am unable to state what proportions the water diverted from that creek into the other watershed bears to the entire flow of Powder River.

1570 The second diversion from Powder River shown upon Exhibit 47, being in Township 54 North, Range 81 West, has been proposed by the Reclamation Service, but its construction is not contemplated at the present time, there being no funds available for Wyoming for a number of years.

1571 From the topographical maps of that country it appears that the Powder River watershed near Buffalo, Wyoming, includes considerable lands susceptible of irrigation, as there are many ditches near there, but below the town of Buffalo for the last thirty miles of the course of the stream through Wyoming, the watershed consists of a series of relatively narrow valleys. I do not understand that the Bad Lands of Montana and Wyoming occupy the drainage area of the Powder River, my information being that they lie east of the Powder River. I am not familiar with the character of the country in the Powder River watershed in Montana as to its availability for irrigation.

1572 It is possible that Montana is as much benefited by the return flow from the diversion from the Powder River watershed into the Tongue River watershed as though the water had been permitted to remain in the former watershed, and if the lands within the watershed of the Powder River in Montana are not suitable for irrigation and the lands within the Tongue River watershed are, I do not know whether the inter-stream diversions would benefit Montana or not.

1573 The other diversions shown upon Exhibit 47 are between the various tributaries of either the Tongue River or the Powder River, and the subsidiary watersheds affected are all united within the State of Wyoming.

1574 The description of the lands shown on Exhibit 48 as being irrigated by diversions from Piney Creek are secured from the records of the Wyoming Board of Control. I cannot state whether some of the water for these lands is not likewise furnished from Prairie Dog Creek, in the watershed of which the lands lie. I know that in some cases where lands have been supplied from several sources, the decrees of the Board of Control attribute such lands to each source, but I did not find any such situation with respect to these lands, although such might be the case in some instances. I made no personal examination to ascertain if in fact these lands were not actually irrigated from Prairie Dog Creek and not Piney Creek. One of the Wyoming State Engineers has stated that before the ditches were built across the divide, Prairie Dog Creek was of little importance and irrigation therefrom uncertain.

1575 The first plat upon Exhibit 49 shows a proposed diversion from Cedar Creek, a tributary of the North Platte River, across the divide into the watershed of Pass Creek, another tributary of the North Platte River. The diversions obviously supply all the lands lying on the north side of Cedar Creek, but also run into the Pass Creek watershed. The streams, watersheds and the ditches are entirely within the State of Wyoming, and the diversions do not affect the North Platte River below the Union Pacific Railroad in Wyoming so far as return flow is concerned.

1576 The second plat upon Exhibit 49 shows a diversion from the watershed of the Grey Bull River, a tributary of the Big Horn River in northern Wyoming, into the watershed of the Big Horn River. The Grey Bull enters the Big Horn within the State



of Wyoming, and below the junction the Big Horn watershed is not affected by the upper diversion.

1577 I have no personal acquaintance with the diversion from Fish Creek, a tributary of the Poudre, into Willow Creek, a tributary of the Laramie, shown on Exhibit 50, but I suppose it has been made or the rights would not have been decreed. Fish Creek is one of several tributaries of Dale Creek, which is one of the tributaries of the Poudre River, and it has no large drainage area, but there are a number of decrees from it in Wyoming. It is actually as well as theoretically a tributary of Dale Creek. The ditch shown upon this plat has an appropriation for 44 acres, and the statutory limit upon the appropriation is one second foot for each 70 acres. I think some of the land irrigated from this ditch is on the Fish Creek side of the divide and some on the Willow Creek side. The second ditch shown on this plat has an appropriation for 26 acres and irrigates land on both sides of the divide. The Hill ditch, also shown on this plat, has an appropriation for 459 acres, and I think some of this land is on the north side of the divide.

1578 I do not know whether investigations were made to ascertain whether the proposed Hetch-Hetchy diversion in California would interfere with the subsequent development of lands within the watershed, although I have known that there was a very strong objection made to the project. I would consider any

1579 report upon this project prepared by John R. Freeman to be authentic, and I assume that his statement of facts is correct in his report to the mayor of San Francisco upon this project wherein he says, pages 82, 83: "In order to satisfy any doubts as to the quantity that the irrigation districts might be able to put to beneficial use under a more intensified agricultural development, or by an increase in the carrying capacity of their canals, or by extending their respective areas to the broadest possible limits, a very painstaking investigation already mentioned, has been carried on during the past year. These investigations make it plain that the districts now comprise substantially all of the arable land lying between the shores of the Stanislaus river on the north and the Merced river on the south, the rough hill country on the east and the swamp lands of the San Joaquin river on the west, and that they thus contain broad areas that naturally should have looked to the Stanislaus and Merced rivers for their irrigation supply, and that there is no important area of irrigable land remaining which would naturally look to the Tuolumne river." As to his conclusions, however, I would not be able to accept them without knowing more about the situation.

I do not know whether the diversions from the Ganges river in India into the watershed of the Indus have prevented the irrigation of any lands which might properly be irrigated from the Ganges or its tributaries, but it is evident that the diversion from the Jumna River would shorten the supply for some of the lower canals. I doubt if the available water supply is greater than the requirements of the large areas running into millions of acres which could be irrigated from the Ganges. I question the statement of the Indian Irrigation

Commission of 1901 as reported in the Encyclopedia Britannica that the irrigation works then proposed would exhaust the irrigable land in India. Such investigations have regard to the projects under consideration at the time, and a project which might not be feasible at one time may become feasible at a later date when conditions have changed and values increased. It is true that many land owners objected to the construction of the Sardah canal to irrigate lands in Oudh on account of the considerable rainfall, and the doubt as to whether the irrigation would not waterlog the land, but I think the canal has actually been surveyed by the Indian Government.

1582 I do not believe that the Sardah project has been indefinitely postponed on account of these considerations. I presume that the statement in the Encyclopedia Britannica relative to the Periyar project that "the rainfall on the west very much exceeds that on the east, and the Periyar used to find its way by a short torrent course to the sea, rendering no service to mankind," is so, but there has been a large reservoir built in Travancore on the west slope near the mouth of the Periyar.

1584 I do not believe the statement in the same encyclopedia that the Western Jumna Canal was originally constructed for the purpose of irrigating lands towards Delhi, which is within the same watershed, is correct, as I understand that its primary purpose was for irrigating lands near Hissen, and that the Delhi branch was built afterwards.

I have no definite information about the projects mentioned in Spain, but they all affect watersheds, canals and ditches within that country, and I have no knowledge as to the effect of such diversions upon subsequent irrigation development.

1585 Redirect examination by Mr. Delph E. Carpenter:

When I spoke yesterday of annual precipitations in portions of India, and particularly mentioned the precipitations of large quantities, I did not mean that those precipitations were continuous during all of those months. The precipitation is like it is elsewhere, that there is in India a rainy season and the year as a whole is divided into two seasons, the period of the southwest and the northeast monsoon, the southwest monsoon occurring during the summer months, is the rainy season, the wind then comes from the Indian Ocean and as it strikes the Chats or Himalayas it precipitates rain in very great quantities so that they have these railfalls of 75 to 100 inches, and I think there is one recorded place that is used as an example of extreme rainfall of as much as 600 inches in the Himalayas, but of course, that is not continuous.

This is what produces the immense run-off of the rivers. For the next six months of the year the wind comes from the northeast, from the interior of Asia, comes over the high Himalayas, and is practically stripped of its water and thus there is the dry season, from October to April, but this dry season is the winter season, as

this country is all below the Tropic of Cancer, it is hot anyway. But the effect is shown in irrigation, that the winter crops are irrigated to a much greater extent than the summer crops. The Kharf crops, the winter crops, I think had about twice as much irrigation for those as the Rabi crops, which are the summer crops, or grown during the period of this southwest monsoon.

Irrigation does not cease in India during the time of a famine, that is when it is increased, if anything, because the shortage of rain or water is the cause of famine. It is generally because of the delay or shortage of rains from the monsoon, the fact that the monsoon does not start in as early as they expect and consequently the precipitation is less. The food production is of course lessened, and as the population is very great, all the time near the verge of the available food supply, it then has very disastrous results.

1587 The large volumes of water flowing in these rivers is eventually indicative of the available water for irrigation. The matter depends upon the expense and upon the available money for construction, and of course whether the returns will justify the expense.

The total heavy precipitation in India does not indicate that they do not need irrigation. The distribution of rainfall may of course have a very decided influence upon the necessities. But right parallel with that great rainfall there is irrigation in every season on an enormous scale. It simply is increased in the case of a dry year or a delayed monsoon. The acreage that takes water from the Government canals is increased perhaps in the neighborhood of one-half. On the other hand, the people to whom a penny may mean a great deal, the expense of irrigation is not to be incurred unless they think it is justified by returns. It requires both irrigation and rainfall to produce a food supply for the country.

The evaporation is bound to be heavy. In the Indus, the rainfall is very much less than on the Ganges side, so that the conditions are intensified, so that the effects of that have been in times past, in the case of the Indus, the population is much less dense with irrigation, than it is on the Ganges without irrigation. For instance, in the

State of Rajputana there are quite large areas that have been 1588 almost devoid of people, notwithstanding the pressure. That is due not entirely to the scanty rainfall, but partly to the local conditions of soil, because there are other places without any greater rainfall that really have quite a large population.

I think all of the inter-watershed ditches crossing between those two watersheds, come from the Ganges watershed.

Hay lands of the river Po of Italy are utterly different from the hay lands of the Laramie Valley in Wyoming. They are hard to compare and are more to be contrasted. The Po Valley is very fertile ground, is at a low elevation and of a moderate climate. The Laramie Valley is not a very rich soil, it is at a very high elevation and has a climate that is practically Arctic in character, or semi-Arctic. The crops that are raised in the Po valley are therefore almost any crops that could be raised at a latitude of practically 40°, and in fact it has a very much milder climate than prevails in this

country at that same latitude. The valley of the Po has always been recognized as one of the richest valleys in the world, of high civilization and a very dense population, so that it has been the envy and has aroused the cupidity of many of the northern nations that came across the Alps. It has been a constant battle-ground by invaders from the north and has been a constant attraction. The dense population is largely because of its growth of hay and grass. The pressure of population makes it so that they cannot afford to let the land lie idle. It is subject to their constant study to keep it busy and one of the crops which they can grow and keep the ground busy for twelve months in the year, is hay. With them human labor is much cheaper than lead. They do not need to economize in labor.

By hay I mean the dry part of grass, but in the Po Valley they use it almost entirely in its green form without waiting for it to become hay, and this is because that same pressure makes it desirable that they cut the grass a number of times. They get frequent cuttings during the year. They obtain their winter crop by winter irrigation, so that they get from two to three cuttings of hay during the winter and, during the summer months, from April to September or October, they get at least one cutting a month. They take this grass to their cattle which they keep in their farm yards so they will not trample the grass, or, in other words, they have a practice of soiling. They raise largely dairy cattle so that these conditions are rather in contrast to the conditions we find in the Laramie Valley, rather than of direct comparison. They are almost different in type and that means, then, that the population runs up in the neighborhood of three to four hundred per square mile over the Valley of the Po.

No hay is produced in the Laramie Valley in the winter time. During the summer months they get one cutting. The production of grass consumed for hay in the Laramie Valley amounts to only one cutting a year. In the Po Valley it amounts to many cuttings.

#### 1591 Examination by Mr. Delph E. Carpenter:

I think some of the projects in India have had the depletion of the flow of one stream to the detriment of possible future development for the benefit of lands on another watershed, as a possible consequence. At least this has been discussed or mentioned in some cases. I have given only an incidental examination to that subject, but in the comments that have been made from time to time, they have apparently simply considered that irrigation when necessary would be carried on, and that if there was any question of conflict of interests, that the early construction was apt to have the priority, and in fact there have been some instances in which the Government has proposed to undertake enterprises that eventually might take water away from tracts that have had it for a long time, where it would do more good in another place. That has been suggested in reference to one of those western Jumna propositions and between the Punjab and United Provinces, where it was considered that there

might be a greater need and a greater benefit to take it across  
1592 the line from those streams.

It seems to have been seriously considered as the proper thing to withdraw the water entirely from certain portions of the Ganges Irrigation drainage, through the Rabi season and to utilize that water upon the dryer tracts where irrigation was more constant and urgently required, even though by so doing, they would work great injury to the lands of the Ganges drainage area. I am not acquainted with the extent of the conflict. A. Mr. Wilson made a report on that subject, but I have never had an opportunity to go through it in detail. The theory of the greatest good to the greatest number seems to have prevailed there.

The principle of diversion seems to be understood so thoroughly, that in any ordinary case, except where it interferes, or where it might interfere with irrigation where it had been practiced for some time, they do not give any consideration to it, at least I have found no mention of it.

The preservation of waters in their natural watershed for a period of years ranging from a few years to a thousand years or more

for the purpose of future development has never seemed to  
1593 enter into the calculation. I have seen no case where they seem to have given that any particular weight except as in the consideration as to where the greatest benefit might be.

Speaking further concerning the rainfall in the Ganges drainage area, I have a rainfall map of the upper part of the Ganges Basin that is more in detail than we had yesterday. The general statements made yesterday are correct, but they perhaps should be extended a little further for completeness and explanation beyond what I have given. This rainfall map in detail of the United Provinces, indicates a larger area that is below 20 inches of rainfall than I in my remarks may have employed, and more than that, there are quite a good many places where the rainfall drops down to less than 15 inches, or as low as 15 inches, and some as low as 7 inches or less, as for instance in the vicinity of Agra. This refers to the annual precipitation. This precipitation nearly all occurs in the course of those three or four months of the spring or early summer. The diagram of monthly distribution of rainfall that I have from the Indian report is simply for the one year 1896-7; but is, notwithstanding, a pretty typical year. In that case the greatest part of the rainfall in that year under the Agra Canal came in July. There was  $\frac{1}{4}$  inch in May,  $\frac{1}{6}$  in June,  $9\frac{1}{2}$  inches in July, nearly all of that coming in three days, and 2.68 inches in August, that was during the period of monsoon. For the rest of the year we have as illustrating the character of their rainfall,

1594 September was practically nothing, .08; October .01; November  $\frac{1}{4}$  inch; December  $\frac{1}{2}$  inch; January .05; February nothing, March .03, and April .02. This illustrates the general character of the distribution of their rainfall through the year. A great portion of the region under the Ganges, or south of the Ganges river, has less than 20 inches annual rainfall. This region is irrigated by the Ganges canals. The major portion of the remaining Ganges

drainage area, shown on this map, which is confined to the United Provinces, has 20 to 25 inches annual precipitation. The lower part of the Ganges Valley I have not discussed, that is just the upper end of it. That includes a considerable portion of the area irrigated by what are called Ganges Canals and the ones especially discussed. There is irrigation further down the valley in larger quantities in the Province of Bengal, evidently that is in a region where the rainfall is heavier. The inference is that the diversion of the Western Jumna Canal naturally interferes with the irrigation in the upper portion of the Ganges area. This inference is drawn from the fact that they have considered means of bringing in additional supply. So far as their reports are concerned, it would appear that the consideration of that came in as a secondary matter, that is, supplementary canals were considered and take up after the diversions had been made. They met the conditions as they found them. Those

1595 supplementary canals are for the purpose of supplying existing conditions. Some of the regions found they could use more water, or the Government thought they could increase the production by bringing in additional supply and support a larger population, or a larger per cent of population than they already had.

Speaking of the Los Angeles aqueduct in California and the recognition of existing rights on the Owens river, I think that the decisions, at least many of them, have maintained the riparian right doctrine. The practice has not always been in accord, because it is a case where the legal doctrines are contrary to the natural development and progress of the country.

The diversion of water from the head of Fish Creek, a tributary of the Cache la Poudre where the Wyoming people are taking water over into the Laramie river drainage area in small quantities, I will state that even that small diversion is an injury to the Poudre Valley. All the water in the Poudre river, especially on Fish Creek, Dale Creek, and the North Poudre is needed, and has been used substantially for years. It is particularly needed during the summer season. Sometimes there has been a scarcity of water on that

1596 stream in Colorado, in canals that have been built for many years. This diversion might, to some extent, interfere with the future development of the Poudre Valley but more with regard to existing things there. It might work an injury to both existing and future development. The difference between this diversion and a larger diversion is entirely a question of degree. This Fish Creek diversion simply illustrates that natural tendency to obtain water where land is situated, so that it can be used and to derive the water from any adjacent or available source.

1596 Recross-examination by Mr. John D. Clark:

The proposals to which I have referred which have been made to divert water from portions of India where it has been utilized into portions which have a greater need for it and which involve a consideration of relative benefits, have been made by the Irrigation Commission of India, which in this connection has considered the



possibility of procuring water principally through other sources for the lands already served, and the reduction of the amount of water to be given to these lands.

1597 This commission was appointed by the Indian Government and was a commission of inquiry without authority to perform any work. Its recommendations were made, I believe, to the Governor-General of India. I do not know whether the Governor-General would have authority to undertake such a project, but I rather doubt if he has, nor do I know whether such a project could be executed by any central authority, or would require a co-operation of two independent authorities. I believe in some cases some such works have been local and have been undertaken by local authorities. The Jumna diversion was into what was originally an independent state, although now under the control of the General Indian Government, but I do not know whether the Emperor Feroz, when he undertook this project, had jurisdiction over the whole territory or not.

The map to which I last referred in my re-direct examination, showing the rainfall in the Northwest Province and Oudh, is for the single year of 1896-7. It covers a large part of the irrigated area of those two provinces, an area about six hundred miles long and two hundred miles wide, lying in the upper portion of the Ganges valley, and running over into the watershed of the Indus River.

1599 The diversion by the Laramie Water Company from Douglas Creek, a tributary of the North Platte River in Wyoming, is into the Little Laramie River, a tributary of the Laramie River, which is also a tributary of the North Platte River in Wyoming. The first irrigation from the North Platte River below the diversion, which is controlled by an independent authority, is that of the Reclamation Service, which diverts water from the North

1600 Platte River in Wyoming below the mouth of the Laramie River, although the dam in which the water for this Reclamation Service project is stored is a long way above the mouth of the Laramie River. Such return flow as may arise from the use of the waters of Douglas Creek when so diverted will be returned to the North Platte River above the diversion works of the Government by a shorter route than if the water had remained in the original watershed, if such waters return at all. I make this qualification because the proposed use of this water is in meadow irrigation upon the Laramie Plains, which involves a very great loss. This loss is largely due, however, to the method of use, and not to the place of use.

Redirect examination by Mr. Delph E. Carpenter:

1601 The place of use may very materially affect or control in the *care* of the Douglas diversion, because of the peculiar topographical conditions of the area to be irrigated. Water turned into the drainage area of Big Basin or the basin of Big Hollow, would not return to the North Platte river, and there are those and

similar basins that take a great deal of the waste water. They are largely blind basins and of course, that is lost by evaporation, unless there be seepage, which is not very clear. No matter where the return may go, a diversion is contemplated and is in process of completion.

As a matter of fact, water diverted from the Laramie river for consumption through the Greeley-Poudre tunnel, will probably reach the forks of the Platte by a shorter and more direct route than it would to go round by the North Platte. That diversion takes place in Colorado and the application of the water is in that state.

By Mr. Fred Farrar:

A map is attached to the answer of the defendants, the Laramie-Poudre Reservoirs and Irrigation Company, and the Greeley-Poudre Irrigation District, which we refer to in the Answer as Exhibit 1. In the evidence heretofore taken in this matter, on one or two occasions I believe this map was referred to as Defendants' Exhibit A. Defendants have, because of this mistake, had another marked Exhibit 1, but not introduced, and I desire to make this explanation to avoid any confusion between the two exhibits.

1602 JOHN R. WORTHAM, Greeley, Colorado.

Direct examination by Mr. Charles F. Tew:

I am thirty-two years old and live at Greeley, Colorado. Have resided there since the fall of 1907. Am a civil engineer, a graduate of Purdue University of Lafayette, Ind., in the year 1905. Received my previous education at Galveston, Texas. I had previous experience in surveying and engineering before entering Purdue University. I was employed by the Gulf, Colorado & Santa Fe Railroad

Company about Feb. 1897, until the Spring of 1898, in the office of the Chief engineer of that Railroad. Subsequently

I was out with an engineering party on location and construction work from 1898 to July, 1901. I first started as a back-sacker on location surveys and afterwards as chain man and rod man on construction works. After that again, was rodman and levelman on location, and topographic and instrument man on maintenance of way works for the Santa Fe, and I became pretty well familiar with railroad work at that time in the use of engineering instruments. I left the High School and entered this work as a matter of necessity. In July, 1901, I severed my connection with the railroad to prepare myself for entrance examination in the University. During the time I was working for the railroad company, had taken up a course of railroad engineering with the International Correspondence School of Scranton, Pa. I had practical experience in engineering before entering Purdue University. I passed the entrance examination to the University and entered in September, 1901. Attended the school of engineering four years, graduated in 1905. I am an Associate Member of the American Society of Civil Engineers. In 1904, in addition to my work at the University, I worked

for Mr. George Weasche, the professor of Hydraulic Engineering in Purdue University, on the measurements of the Tippecanoe and Wabash rivers. He was obtaining data for the probable establishment of a power plant near Lafayette, Ind. I did this work for compensation to help me in supporting myself at the University. I was engaged in this work from September, 1903, to the spring of 1904, at different times. From this work I gained a knowledge of stream measurements. I became familiar with the use of current meters and flow of streams.

Immediately after graduation from Purdue University, was employed by the Pennsylvania, New York & Long Island Railroad Company, on construction of tunnels, under East River, at New York City. Subsequently was employed by Union Pacific Railroad Company as Assistant Engineer on double track construction in the State of Wyoming and on the completion of that part of the double track work I was given charge of construction of bridges and buildings on the Colorado Division of the Union Pacific Railroad Company under the direct supervision of the resident engineer. I left the employ of the Union Pacific R. R. Co. in the early fall of 1907 and located at Greeley for the purpose of engineering work.

I established an office in engineering at Greeley and still have that office. I am the engineer for the defendant, the Greeley-Poudre Irrigation District. I practiced at Greeley from the fall of 1907 till June 1909 before becoming engineer for the district. Was engaged in general engineering, measuring ditches, making surveys of various irrigation propositions, preparing maps for filing with the State Engineer, etc., and the general engineering business that would be practiced in an irrigated country.

Became acquainted with the Greeley-Poudre Irrigation District immediately after my arrival in Greeley, but had no connection with the project until June, 1909. I became chief engineer for the district and have held that position since. At the time of employment by the district, made an inspection of the work proposed and also of work done, acting in an advisory capacity at the voting of contract of September 8, 1909. I made trips of inspection in all of 1909 until September, with various parties. I held several conferences with Mr. Charles R. Hedke, the Chief Engineer of the Laramie-Poudre Reservoirs & Irrigation Company as to what was proposed; the plans that he had drawn for the system of works, etc. Made inspection trips with Hedke over the water supply on Laramie River, over lines of ditches and reservoirs and became thoroughly familiar with conditions and with what the District was going to receive.

1608 Made several trips over district with Board of Directors and attorney. Investigated all of the various reservoirs of the Greeley-Poudre District. In August, 1909, made inspection trip on Laramie river with directors of District, Chief Engineer of Laramie-Poudre Company and others, taking several days.

1609 Viewed the tunnel site at that time. The site then inspected is the location of the present tunnel. Also inspected the site of the dam to be constructed for regulating the flow of waters

into the Laramie River tunnel by means of reservoir. Was shown the lines of the east side and west side collection ditches, taking water from Rawah and other creeks back to the tunnel. The present ditches are along these lines.

1610 Inspected Boyd Lake to ascertain whether or not it was feasible to obtain water by exchange from that source. Was present through the negotiations between the District and the Company, leading up to the drafting of the final contract in September, 1909, between the District and the Construction Company.

The system of Works of the district was to be completed for \$5,000,000 in bonds. 125,000 acres of land are to be served by the district works. Contracts for completed system of works ratified October 1909, by vote of the electorate of the District. Prior to this time made surveys for laterals from main canals of District for service of lands. Had party of men in field with me. Preceding October, 1909, had familiarized myself with all parts of system from the Laramie river to the lands.

1613 Out purchase price of \$5,000,000, \$500,000 was set aside to retire indebtedness incurred by previous owners of the Irrigation District prior to the Laramie-Poudre Reservoirs and Irrigation Company. \$3,500,000 of bonds was placed in escrow for delivery for completion of system. Work of completion to be done in stages and paid for monthly upon estimates.

1614 I was engaged in taking of estimates and inspection during all of construction.

1615 Before 1909, a large amount of work had been done from eastern terminus of Poudre Valley Canal, which was then constructed, along line of now constructed portions of canal. Am thoroughly familiar with all of the work of the District from the headwaters of the Rawah and McIntyre Creeks and other tributaries of the Laramie river and throughout the distribution works of the system. Have been on the summit of the Medicine Bow range at the headwaters of the streams supplying the district.

1616 The Sky Line canal of The Water Supply and Storage Co., takes its water from the West Fork of the Laramie river, and discharges water into Chambers Lake at a point at the extreme southern edge of what is called the Green Mountains. The headgate is in the Laramie watershed and the discharge at Chambers Lake is in the Cache la Poudre watershed. I have been over the Sky Line Ditch. I have been across the Green Mountains from the west portal to the east portal of the Greeley-Poudre tunnel a number of times. This is a chain of mountains beginning at Chambers Lake and running northerly and northeasterly and finally called Boulder Ridge, Sherman Mountain, and Black Hills.

1617 Am familiar with this ridge of mountains. The Wilson Supply Ditch takes water from Deadman Creek and carries it over the divide into Sheep Creek, which is a tributary of the Cache la Poudre watershed. These canals constitute an inter-watershed diversion and belong to the Divide Canal and Reservoir Company. It is a constructed and operating ditch. I have observed the Sky Line Ditch while in operation. Headgate of Wilson Supply Ditch is in

drainage area of Laramie river. It takes its water from Deadman's Creek, carries the water into Sand Creek, then along that creek to the ditch known as the Divide Canal, where it is carried over the divide between the Laramie and the Poudre rivers and discharged into Sheep Creek, a tributary of the North Fork of the Cache la

Poudre, which discharges into the main stream in the cañon above the headgate of the Poudre Valley Ditch.

I have made surveys of the lakes at the headwaters of Rawah, McIntyre and other tributaries of the Laramie river, commonly known as Link Lakes, and spent some weeks on that portion of the work. I camped in the immediate vicinity of these lakes. It is a country very difficult of access. Went in there with teams, going over a road previously constructed by Messrs. Link and Akin. The going was very difficult. Surveying and construction operations in that region are limited to a short period during the summer season. The season is very short near the Link Lakes and it is impossible to haul supplies in there during any but the summer months, the latter part of June, July, August and possibly the first half of September. After that the snows come in very heavy and it is impossible to get supplies in there in order to carry on construction work. These lakes lie just on the eastern slope of the Medicine Bow Range. The upper lakes are about half a mile from the crest of the range. They lie in the region of perpetual snow. The Link and Akin road is necessary in order to get supplies into that region unless they are packed in there on the backs of animals.

Supplies have to be hauled from the railroad points on wagons, principally from Fort Collins or Laramie, Wyoming. These lakes are about 80 miles from either of these towns by wagon road. The road from the Laramie river up to the Link Lakes is very mountainous.

I have been over the Greeley-Poudre works in Laramie valley during the years 1910, 1911, 1912 and 1913, very many times, although have not been up to the headwaters of the McIntyre and Rawah Creeks as much as I have been over the works in the valley proper, many times in company with the engineer Hedke or his assistant engineer, Coy. Visits occupied period of from two to three days to a week or ten days and sometimes longer. Visits sometimes oftener than once a month. Since active work ceased, have been in the Laramie Valley an average of five or six times a year.

I made a survey of the entire Laramie Valley from the Greeley-Poudre tunnel northward to the state line. The snowfall on the Medicine Bow range is approximately the same through the line of the watershed, heavier in places than in others, the timber having something to do with the holding of the snow and keeping it from blowing away.

The southern extreme of the watershed has elevation of about 13000 feet. There is a peak called Clark's Peak, which has an elevation of some two or three hundred feet in excess of 13000 feet, but the average elevation in Colorado at that point is about 11000 to 12000 feet. Going northward the range and watershed drop somewhat. At places it is 9000 to 10000 feet. At headwaters of

the Little Laramie river you get an elevation of something like 11000 feet. Have been at the point where the Greeley-Poudre tunnel pierces the Green Mountain Range, many times. Have been on the crest of that range several times. Have been at place about eight miles north from tunnel where the Wilson Supply Ditch crosses this range. From tunnel location northward the Green Mountains widen and spread out. There is no location north of Greeley-Poudre tunnel where a similar tunnel could be constructed. From Chambers Lake down to the Greeley-Poudre tunnel the Green Mountains are comparatively narrow and the Cache la Poudre river flows nearly parallel to the Laramie river. From the tunnel site the Cache la Poudre turns and runs nearly due east, while the Laramie river flows north and a little west to the Colorado state line. From the point opposite the tunnel on Green Mountain, the Laramie river leaves the top of the divide going northward and the Cache la Poudre very materially increases the distance from that river to the top of the range. The range broadens out at the base.

There is no point northward of the present Greeley Poudre tunnel at which a tunnel can be feasibly constructed to divert water from the Laramie river to the Poudre watershed.

I was on Laramie river in 1910, 1911, 1912 and 1913. The Greeley-Poudre district and the Laramie-Poudre Reservoirs & Irrigation Company have maintained an engineering camp during all of those years on that river. This camp is a good, comfortable five-room house, several tents and equipment.

1625 I have made personal examination of the Cache la Poudre river from Chambers Lake to the point of discharge into the South Platte river below Greeley, Colorado. I personally made one survey of the Elkhorn Reservoir site. In October, 1909, assisted in making certain surveys on the Cache la Poudre side of the Tunnel.

1626 I have made personal inspection of the several sites upon which reservoirs were to be constructed on the Cache la Poudre river for the district. I examined the location and surveys of two of the dams and reservoir basins and personally made a survey of the third. I completed the surveys of the Elk Horn reservoir site in June and July, 1913. This reservoir had previously been surveyed by Mr. McFadden, of Denver, who had also surveyed the other reservoirs in the river. I made examination of the foundation of the dam and the bedrock across the stream at the dam site. I

1627 calculated the storage capacity of the Elk Horn reservoir to be 1,500,000,000 cubic feet, or 34,500 acre feet.

1628 I have surveys of the Poudre Valley ditch from the head-gate of the Cache la Poudre river to its terminus, also of all extensions of that canal.

I designed the plans and superintended the actual construction of the concrete lining installed in the Greeley-Poudre tunnel. I designed the plans about December 1, 1911, and the work was completed May 1, 1912. I resided at the east portal of the tunnel during construction.



1629 I am familiar with the character of the channel and the course of the Cache la Poudre river from the east portal of the Greeley-Poudre tunnel to the head of the Poudre Valley Canal. This canal constitutes the principal diversion canal of the Greeley-Poudre Irrigation District. The District has sources of supply of water from the Cache la Poudre river.

The Mitchell Lakes constitute a group of reservoirs situated on tributaries of the North Fork of the Cache la Poudre river used for reservoirs by the district. I have been in charge of and operated these lakes and the ditches from them. We have used the water of the lakes for irrigation of land in the Cache la Poudre Valley and they were used prior to the time that they were obtained by the district. They obtain all of their water from the tributaries of the Cache la Poudre.

1630 I personally designed a number of improvements for the Poudre Valley Ditch; headgate enlargement, lining of canal with concrete for over a mile and other improvements. Have made surveys of Cobb Lake and the outlet canal for the same. Made detailed surveys of Lake McGrew. Also of the March reservoir, the Dover Reservoir, the Briggsdale Lateral, the Canfield Reservoir, the Nunn Lateral, the Pierce Lateral, Middle Lateral. These surveys of mine were all subsequent to many previous surveys that had been made by other engineers before I became associated with the system.

I have made careful and detailed surveys of the irrigable land in the Greeley-Poudre Irrigation District, re-checking a previous survey made by Charles R. Hedke. There are 160,000 acres of land, good and bad, within the boundaries of the District. There are about 125,000 acres of this land which are irrigable from the works of the District. This acreage includes that held in fee simple title by government entrymen and others holdings.

The Greeley-Poudre canal, sometimes called the Laramie-Poudre canal, marks the upper boundary of the district. The lands lie south and east of that line of canal and their general slope is in that direction. The district lands extend southward to the present northerly boundaries of the irrigated area of the Cache la Poudre Valley.

1634 The Greeley-Poudre Irrigation District is practically an addition to the already developed areas of the Cache la Poudre Valley. The general fall of the lands in the Greeley Poudre Irrigation District averages from twenty to twenty-five feet to the mile. It is about the same as the fall of the irrigated country in the valley. The lands of the District are now in a dry arid state. Large areas of this land have been broken and planted to crops and have wholly failed for lack of water. The land and soil of the District compares very favorably with that of the irrigated areas of the south. There is no line of demarcation between the area of the district and the older irrigated area to the south. Generally speaking, the soil is

1635 comparatively uniform throughout the district.

I prepared the map attached to and forming a part of the answer of defendants, the Laramie-Poudre Reservoirs and Irrigation Company and the Greeley-Poudre Irrigation District in this case. The work covered eighteen months. I commenced in June, 1911,

and completed the map in January, 1913. I refer to defendants' Exhibit 1. It has sometimes been alluded to as defendants' Exhibit A. The main object of the map was to show with the greatest degree of accuracy, the Laramie river and its watershed from the headwaters to the point of discharge into the North Fork of the Platte river near Fort Laramie, Wyoming, and the Cache la Poudre river from its headwaters to its point of discharge into the South Fork of the Platte River below Greeley, Colorado. The crest of the Divide between the Cache la Poudre and Laramie drainages is indicated by a line which also defines the boundaries and watersheds of these two forks of the main Platte river. In the preparation of the map I have endeavored to show this line of demarcation. I have indicated the location of the works of the defendant district. Also the portion of the Laramie river watershed intercepted by the works of the District. I also indicated other ditches which are taking water from the Laramie river in the State of Colorado. The Sky Line Ditch taps the west fork of the Laramie river and carries the water in a southerly direction into Chambers Lake over the divide between the Cache la Poudre and the Laramie rivers. From Chambers Lake this water flows down the Cache la Poudre and then to the irrigated section of the valley. The Wilson Supply Ditch and the Divide Canal taking water from tributaries of the Laramie river over into the North Fork of the Poudre are also shown.

The tunnel which diverts water from the Laramie river and conveys it into Blue Grass Creek in Wyoming, by means of which the Wheatland tract is irrigated is shown on the map.

The work of preparing this map did not take my time continuously for eighteen months, but probably six months of that time was actually consumed. I obtained data from every available credible source. I used the Quadrangle Sheet of the United States Geological Survey wherever possible, and information contained on them was accepted as correct. These sheets included the Greeley, Eaton, Loveland, Livermore, Quadrangles in Colorado, and the Laramie, Sherman, Medicine Bow, Goshen Hole, Hartville and Patrick quadrangles in Wyoming; also the sheets issued by the United States Reclamation Service of the North Platte Project in the states of Wyoming and Nebraska. Where quadrangle sheets were not available I gathered all the maps and data that I could find that would in any way pertain to the territory in question. I obtained data from the Surveyor General's office in Cheyenne, Wyoming, and in Denver, Colo., from the offices of the State Engineers of Colorado and Wyoming, from the records of the county clerks and recorders of Weld and Larimer counties in Colorado. I also consulted maps of the

1639 Wheatland Industrial Company of Wyoming, the Goldsborough Engineering Company who had to do with the Laramie Plains system; the Talmadge-Buntin people of Chicago, and maps published by different publishers from surveys and data otherwise obtained. Data was gathered in Wyoming under my direction by Mr. B. C. Bellamy, of Laramie, Wyoming, an engineer. I was also assisted by Mr. C. C. Washington from actual surveys of the Wheatland area, from surveys by Mr. Charles R. Hedke, Engineer,

Mr. Zac T. Duvall, Engineer, and Mr. C. E. Black of Laramie, also Mr. Burgess Coy and numerous and divers other engineers. The location of the Union Pacific Railroad was obtained from data received from the office of the engineer at Omaha. The map, Exhibit 1, is made on a large scale owing to the scope of the territory embraced. It is a print obtained from a tracing, which in turn was made after all data had been traced and noted in lead pencil on drawing paper. Each location and set of figures was thoroughly checked.

1640 I also made personal inspection of most of the places to verify the correctness of the map. In preparing the tracing I had the prints made and thereafter colored the maps by hand. I spent two or three weeks in the office of the State Engineer at Cheyenne, Wyoming, and made copies of township plats that are on file at that office showing the ditches and the sources from which these ditches receive water supply. These copies cover the entire Laramie river drainage in the State of Wyoming. They are official maps. They are taken from the actual filing maps made by the different engineers who had surveyed and located the different ditches.

1641 I understand that the maps were made from plane table surveys. I checked their work against the topographic sheets and found them to be accurate in the main.

The Wheatland, Wyoming, territory was checked in person by Mr. C. C. Washington. I received a plat from Mr. Bellamy of Laramie, whom I employed to do some work. I also made personal inspection trips over a great deal of territory.

1642 The greater portion of the territory on the map is covered by the government quadrangle sheets. That not covered by the sheets embraces that portion from about range 72 west to the west border line of the map, extending north and south from a line on the south of township 6 north to the boundary line of the State of Wyoming and Colorado. Also in Wyoming from the south line of township 19 north and extending northward to the north boundary of the map and from a point about the east line of range 67 westward to a line about on the west line of range 77. That is the country in Wyoming taking in the Wheatland reservoir location and the Laramie river from a point opposite Cooper Lake to and beyond the town of Uva, Wyoming. There are no quadrangle maps obtainable for that part of the Laramie River watershed lying within the confines of Colorado; no topographical surveys of that country have been made so far as I know.

The crest of the watershed between the Laramie and Poudre Rivers is noted on Exhibit A by a brown or burnt sienna line. The location as given is substantially correct. The western boundary of the watershed in Colorado was obtained by consulting several

1643 maps and particularly those prepared by engineers Zac T. Duvall and C. W. Beach from surveys made by them at Link Lakes; also from other maps available. After drafting the map, the survey of Link Lakes took me into the neighborhood of the Medicine Bow range, and while making that survey I ran triangulation lines to the top of the range, and located a point at the crest opposite the head-

waters of the McIntyre. I also did the same at the headwaters of the Rawah. These demonstrated that the location of the crest of the watershed is correct as shown on the map.

The territory indicated in green on the map is the territory embraced within the boundaries of the Greeley-Poudre Irrigation District. It includes all land within the boundaries whether servable or not. The watershed of the Laramie River intercepted by the Sky Line Ditch is indicated in yellow. That part intercepted by the works of the Greeley-Poudre system is indicated in purple.

1645 The irrigation works indicated in red belong to the district.

The irrigation system for the carriage of water from the Laramie river to the District is described about as follows: From diversion on McIntyre Creek, water will flow through the McIntyre ditch to Rawah Creek, then down the creek to the West Side Mountain Ditch, down this canal to a regulating reservoir near the mouth of the tunnel, through this reservoir into the tunnel, and thence to the Cache la Poudre river, thence down the Cache la Poudre river in an easterly direction into the Poudre valley canal, through this canal and the extension of this canal known as the Laramie Poudre Canal to McGrew reservoir, through McGrew Reservoir and its outlet to the Briggsdale Lateral, to the terminus of that lateral, a total distance of about 190 miles.

1646 There is also a ditch collecting the streams on the east side of the Laramie Valley and running to the tunnel known as the East Side Collection Ditch. It is 41,100 feet in length.

It is about thirteen miles from the diversion on the McIntyre to the tunnel. The total drainage area of McIntyre creek is about 40 square miles. About two squares miles of this drainage area is intercepted by McIntyre ditch. McIntyre creek compares quite favorably with the Laramie River at the point of confluence. I have seen it flow about as much water as the main river.

1647 Water flows about 2,500 feet from McIntyre creek through the McIntyre ditch into Rawah creek, thence down Rawah creek about five miles to the West Side Collection Ditch, thence 26,800 feet to the tunnel. The dam of the tunnel reservoir is about 1,400 feet north from the west portal of the tunnel.

The Greeley-Poudre tunnel is 11,366 feet long between portals. Is 7½ feet high and 9½ feet wide, and has a grade of one and seven tenths feet per hundred feet. The east portal or the portal on the Poudre river side is near a small creek which discharges into the Poudre river, called Tunnel Creek. This portal is about 1,500 feet from the Cache la Poudre river. The east portal is about

1648 300 feet *feet* higher in elevation than the Cache la Poudre river. The elevation of west portal of tunnel 8,550 feet.

1649 In October, 1909, I assisted in locating the pipe line on the Poudre river side for the generation of power for the driving of the tunnel. The power plant was installed under direction of Charles R. Hedke, and consisted of rock-filled crib diversion dam in the river above site of power house and immediately above Poudre river falls. Woodstave pipes, 22 inches in diameter and 8,700 feet long connected the dam with the power house, and conveyed water

to run 50 inch Pelton Water Wheel which was directly connected to a blower with a capacity of 13 cubic feet of air per revolution and a speed of 245 revolutions per minute. There was another Pelton wheel with double nozzles, belt connected to a 150 kilowatt electric generator for transmission of power from east portal to west portal, and another Pelton wheel connected to an air compressor for furnishing of compressed air to operate the rock drills.

There was a transmission line about three miles in length from the east portal to the west portal, and at the west portal there was installed an air compressor of the same size as the one on the east side, a blower, and also a hoist. These were driven by motors. There was also other machinery. Machinery was necessary to operate the plant. The air compressor furnished power for the drills. The blower furnished ventilation, the hoist on the west side was necessary for getting the excavated material out of the tunnel and the generator furnished current to operate motor installed at the west end of the tunnel. Mr. McIlwee, the contractor had installed a small steam plant and a compressor at the east portal of the tunnel, before the installation of the electric plant. He drilled 1651 probably three or four hundred feet of the east end of the tunnel prior to the installation of the electric plant. He abandoned the steam plant as soon as the electric plant was ready.

At both the east and west portals of the tunnel large camps were established, each capable of taking care of 60 or 70 men. The camps were all electric lighted and each looked like a miniature city, surrounded by tents, stables and other like out-buildings.

The plant and the machinery were all transported by team from Fort Collins, a distance of about 65 miles to the east portal. All over mountain roads. The transmission line over the mountains was done with a pack outfit.

1652 Work was prosecuted continuously day and night from the time it started until the completion of the tunnel: on the east portal with a force of 65 to 70 men, and with about the same force on the west side for about ten months. Work was carried on in three shifts of eight hours each. The contractor claimed to establish a United States record for tunnel drilling. The two bores met in the tunnel July, 1911. There was no deviation in the line at meeting and the grade of the tunnel is uniform throughout. The total cost of the tunnel and power plant and the concrete lining was about \$600,000.

1653 It is still necessary to line about 40 feet of the west end of the tunnel with concrete and to remove the tracks from the tunnel. I designed the plans for the lining of the tunnel. These were later approved by the State Engineer and also by Mr. Hedke. 1104 linear feet of the tunnel were lined. The longest section lined was 450 feet, and the shortest 12 feet. With the exception of one place near the center of the tunnel where the 450 feet of concrete lining is installed, the material encountered in the construction is hard granite. At the places where the tunnel was lined seams were found and the rock was slippery and in shooting in construction it had been loosened up so as to make it insecure.

1654 The lining is circular, the top being a semi-circle and the bottom a three centered arch. It is one foot in thickness and was reinforced with steel rails originally used in the tunnel pipe and other steel. It is hooped every 12 inches longitudinally with steel rails and had pipes and rails running at right angles to the hoops on both bottom sides and top. I had supervision of the work. It was very difficult because of the conditions under which the work had to be prosecuted. Cement was purchased in Denver, shipped to Tie Siding, Wyoming, and from there transported by wagons and teams to the west portal of the tunnel, a distance of 50 miles over mountain roads. It required four-horse teams and consumed four days for the round-trip for each team. 5,000 sacks of cement were used and 1,104 feet of lining cost \$20,507.19, the cost per foot being \$18.57 $\frac{1}{2}$ . The work was done entirely by the district and not by contract.

1656 A portion of the approach cut between the river and the west portal is not yet complete. (Shown as completed at the conclusion of the testimony). It will cost \$8,500 to complete the tunnel so that it will be ready to carry water. Contract has been let to complete this work, but prosecution has been delayed on account of heavy snows which blocked all manner of trans-

1657 portation into the Laramie river. About ninety days' work will complete the tunnel.

1658 A large amount of work has been done on the East Side Collection Ditch from Deadman Creek southward towards the tunnel. The same is true of the West Side Collection Ditch. Water flows in these ditches southward, while the water in the

Laramie river flows northward. The elevation of the headgate at the East side Collection Ditch at Deadman Creek is approximately 200 feet above the channel of the Laramie river opposite the headgate, and is about one-mile east of the channel of the Laramie river. The ditch is constructed on a steep side hill and the same slope prevails below the ditch as does above. The slope breaks about 100 feet in elevation below the ditch. It is more gradual from there down to the river. The ditch runs south to Nunn Creek, the grade varying from Deadman to Nunn Creek. In the solid material the ditch has a larger grade than it does in the loose material and the size of the ditch varies. In the loose material the grade being changed, the section of the ditch is enlarged, and the solid material, grade being increased, size of the ditch

1660 is decreased. The carrying capacity of the ditch from Deadman Creek to Nunn Creek, a distance of 15,000 feet, is 125 cubic feet per second. This ditch extends a greater portion of the way along mountain sides which are precipitous. This section of the ditch is about 98% completed. The materials encountered are mostly loose rock and solid rock. In the Deadman Creek division there were 288,300 yards to be removed. 62,157 cubic yards of solid rock and 220,377 cubic yards of loose rock and earth are at present removed. There is 22% of solid rock in this division.

1661 This division was peculiar in that it did not require much blasting. The remainder of this East Side Ditch and all of



the West Side Ditch require more blasting. On the division of the East Side Ditch between Deadman Creek and Porter Creek there was some team work and some pick and shovel work. Would say about one-half of each. On Nunn Creek Division of this work there was some team work. There was none on Porter Creek Division. There was no team work on the West Side Ditch.

The displaced materials are all placed on the lower side of the ditch in order to form an embankment and to get rid of the material and furnish a slope for retention of water. The cut is much higher on the upper side than on the lower side of the ditch  
1662 in many places. The slopes in places along these mountain ditches is as much as 40 feet cut on the upper side, while on the lower side it would not exceed more than two feet. This is occasioned by the character of material and the slopes of the mountain.

Material was removed in the construction of the larger portion of these ditches by the use of picks, shovels and powder. It was drilled and loaded with dynamite and loosened by the explosion, and that material was afterwards shoveled over the bank. Larger rock was placed on stoned outs and hauled up to the top of the lower bank and rolled over and some material was placed with wheelbarrows used on plank runways.

1663 The excavation work on the West Side Ditch was begun in the winter of 1909 and operations on both ditches ceased October, 1910.

Labor ceased on these ditches after this suit had been instituted. At least a month later, I think.

Mr. Hedke, in the original plans, designed diversion dams in Deadman, Rawah and other creeks, and also designed waste gates at numerous points along the line of both ditches. These plans have not been changed. The district has ordered me to prepare plans for what are termed overflow sections for these ditches, in addition to the waste gates designed by Mr. Hedke, as I reported to them that

I did not think these waste gates were quite large enough.  
1664 Both spillways and waste gates will be installed for the operation of the ditch. They are necessary for the safety and proper operation. The water in Deadman Creek in times of freshet, will more than fill the ditch and the excess will go over to waste ways. My suggestions for the construction of overflow sections, as well as spillways, are the result of observations of the waterflow in the streams. These observations cover four years.

I was in the Laramie valley during high water period in 1910, 1911, 1912 and 1913. These streams have a very heavy flow  
1665 of water during that time. The high flows from the watershed on the East are discharged earlier than those from the west side. The East Side flow starts between April 15 and May 15, and the West Side flow starts from the early part of May and continues to the early part of June. This is varied in different years, but as a rule occurs about at these times. The heavy flow in the Laramie river in this vicinity from the tributaries comes first from those on the east side and second from those discharging from the west side.

The east side starts first because the drainage receives the warm sun of the afternoon and, being at a lower elevation, receives a little less snowfall than does the west drainage. The snow on the east side does not pack as hard as it does on the west side. The sun striking the snow in the afternoon melts the snow quicker and starts the melting of the snow sooner. This is also aided by the spring rains. In the Laramie Valley it frequently is raining on the east side while it is snowing on the west side of the watershed. It may be said to be an almost invariable rule that the water from the east side starts first and reaches the peak of discharge at about the time that the 1666 west side creeks, such as Rawah and Rapid, are beginning to come out. I am speaking from my own personal observation. The highest point of discharge has been reached on the east side before the highest point of discharge has been reached on the west side by from ten to twenty days.

The streams on the east side of the Laramie river in Colorado do not rise uniformly. The run-off will rise gradually for a time, and then owing to climatic conditions, will rise very suddenly. This will gradually subside again to the normal flow of the discharge. After a time another peak of great discharge will suddenly come and that is true of the out-flow of the entire east side drainage throughout the season from point of low discharge to the peak or maximum 1667 discharge. These statements are made from observations made by me while I was in the Laramie valley. I have been on the upper drainage sheds of the Rawah when it was snowing up there and raining in the Laramie Valley and on the east side. The crest of the ridge at the easterly extreme of the watershed is much lower than the crest of the ridge on the west side of the drainage area, commonly called the Medicine Bow Range. The east ridge, commonly called the Green Mountains, has an elevation between 9,000 and 9,500 feet at the tunnel, while the Medicine Bow Range near there has an elevation of some 11,500 to high peaks of 13,000 feet and over. The timber on the drainage shed above the west side ditch is very much heavier than the timber on the drainage shed above the east side ditch, taking the whole area of each watershed into 1668 consideration. The east side drainage receives the afternoon sunshine during the time that the precipitous slopes on the west side, which is on the east side of the Medicine Bow Range, will be in the shadow more or less, and therefore will not receive the benefit of the sun as much as does the east side of the drainage area.

The east side collection ditch will not be able to divert all of the water flowing in Deadman Creek. Moreover, the waste gates at Deadman Creek will be left entirely open during the winter, from the first of November to the first of April. This is necessary 1669 because the snow fills the ditches and prohibits keeping the ditch open during the winter months. This water is lost to the system and is in addition to any losses that will occur through leakage through the diversion dam and waste gates. The East Side Ditch at points is constructed through loose rock and boulders, resting on a steep mountain side. About 40 per cent to 50 per cent of the total length of the first division of this ditch is through this kind

of material. This material permits the loss of water by seepage. I have observed many places along this ditch where the ground above the ditch was dry while below it was wet. This material is very similar to that encountered in the approach cut to the Laramie river tunnel where I found water 1,100 feet distant south of and about two feet above the level of the water in the stream.

I have observed the Sky Line Ditch. Some of the material through which that ditch is constructed is very similar to the material through which the East Side Collection Ditch of the Greeley-Poudre 1671 system is constructed, although it is more like material encountered on the West Side Collection Ditch of the Greeley-Poudre system. The East Side Collection Ditch from Deadman to Nunn Creek will carry water better, in my judgment, than will the Sky Line Canal, as a whole. The slopes below the Deadman—Nunn Creek Section are not quite as steep as those below the Sky Line Ditch and the slope is not so long because the Sky Line Ditch is higher up on the side hill than is the Deadman Ditch. Some of the water flowing in the streams intercepted by the East Side Ditch will pass by it and will not be intercepted by it. Much of the water precipitated on the watershed above the ditch does not find its way into the creeks and is from side hill drainage, some of which 1672 will find its way into the ditch. I am basing my conclusions on what I have seen at the Sky Line Ditch.

The East Side Ditch is built on what might be termed a steep grade. It has a grade of two and one-half feet per thousand feet in the loose section and four and one-half feet per thousand feet in the solid section throughout the portion from Deadman Creek to Nunn Creek. Such a ditch will not deposit silt on the bottom and sides of the canal. It will be carried in suspension. It is more likely to erode than to deposit. The losses in this ditch will be materially larger from seepage than they would be in a ditch of a similar 1673 size and similar construction on the plains. In the Poudre Valley Canal, taking water from the Cache la Poudre river, there is a section about 7,000 feet long, which is built on steep side hill through loose and solid rock and the losses from seepage in this section are very great. This is the section through which these large losses occur and it is intended to line this with concrete for the purpose of conserving the water that flows from the ditch, thereby saving heavy losses from seepage.

Water which escapes from the collection ditches of the Greeley-Poudre system through seepage and otherwise will flow down into the Laramie river and from thence into the State of Wyoming. No part of this water can ever again be recaptured for use in Colorado through the Greeley-Poudre system, or through the Sky Line or Wilson Supply Ditches. This seepage water will flow by sub- 1674 surface channels into the Laramie river or directly over the surface back into the stream.

In Contract of September 8, 1909, between the District and the Company, there is a waste way called for under the plans made by Engineer Hedke and located between Deadman and Nunn Creeks on the East side ditch. It will be put about half-way between the

two creeks. The purpose will be to take care of excess of water that will come into the ditch from the side hill drainage between the two creeks. By side hill drainage I refer to the fact that there is quite a long stretch of country between these creeks that catches quite a large amount of snow and drainage and the water from this will be discharged into the ditch along the side hill slopes through small ravines. These ravines run water from 15 to 30 days during times of high water. The quantities of the run-off are variable. The flow of these small streams on the side hill is very rapid. They discharge their water very quickly and the run does not last as long as it does in the creeks.

The East Side Ditch crosses Nunn Creek with an embankment across the bed of the channel of the stream, which might be termed a diversion dam. It was not planned to put a dam in Nunn Creek of the same kind that was designed for Deadman Creek. At this point there will be waste gate put in the bank of the ditch. These gates are so constructed that they may be raised or lowered to permit the withdrawing of all of the water from the canal. The top of the waste gates is at the same elevation as the high water line in the canal. These waste-ways serve as an automatic discharge of excess water from the ditch. When the ditch is carrying its full capacity, the high water line will be exactly on the same elevation as the top of the waste ways and any excess water will find its way over the gates and into the Laramie river below the ditch line.

An overflow section will be constructed near Nunn creek on this ditch. It was not included in the contract, but has been added by me. The spillway and waste gate was in the contract between the District and the Company. This waste gate was not sufficient to take care of the excess water that would flow down Nunn Creek and for that reason I recommended a design of an overflow section to be sure to have enough overflows so that the canal would not be endangered by excess water at that point. The same is true at Deadman Creek, between Deadman and Nunn Creeks there is a waste gate designed in the original contract, but no overflow section at that point.

There will be times that all of the water taken into the canal at its headgate at Deadman Creek will be discharged over the spillway before it reaches Nunn Creek owing to the accumulation of water in the canal from Nunn Creek and the ravines between Deadman and Nunn Creeks. This water will pass down to the Laramie river. Nunn Creek is a smaller stream than Deadman Creek, and given to more erratic flows. At times it will carry more water than Deadman Creek, although the total discharge will be more in Deadman than in Nunn Creek. Generally speaking, the streams are quite similar.

The East Side Collection Ditch is 1,100 feet in length between Nunn Creek and Porter Creek. The ditch increases in capacity from Nunn to Porter creek and between these two creeks has a capacity of 250 cubic feet per second. The material encountered on this division is a loose rock and boulder material. It is a little more difficult of construction than what is termed the Deadman Creek

1679 division, from Deadman to Nunn creek, it being almost impossible to use teams in this portion of the work. The material was all classified in this division as solid rock and loose rock. There were 20,000 cubic yards of material removed from this division, twenty per cent of the same being solid rock. The quantities being 4,000 cubic yards of solid rock and 16,000 cubic yards of loose rock. This work was practically all done with picks and shovels and wheelbarrows. It required quite a large amount of blasting and will require quite a large amount to complete it. The ditch is located along a less precipitous hill in this division than on the Deadman Division. The ditch through this portion of the division is through solid rock and boulder.

1680 Am familiar with the water flows in Nunn Creek from observation of them from time to time. There will be times when there will be more water diverted by this ditch from Deadman, Nunn and Porter creeks than the ditch can carry. This excess water will go into the Laramie river and down into the State of Wyoming. At Porter Creek a flume will be installed when work is resumed on this canal. Water will be taken from Porter creek through a small, supplemental canal, which will have a capacity of

25 cubic feet per second and will discharge into the East Side 1681 Collection Ditch below the point of crossing. Am familiar with the flows of water in Porter Creek. There are times when the flow is in excess of 25 cubic feet per second. This excess water will pass over the diversion dam in Porter Creek and also over the wasteways that are designed at Porter Creek, shown in the original contract, and part will find its way down the natural channel of Porter Creek to the Laramie river and part will go over the waste ways at Porter Creek and down into the same river, the water finding its way from there to the State of Wyoming. Porter Creek is a smaller stream than either Deadman or Nunn Creek, and in my opinion it does not flow during the season as much water as either of these other streams, although the flows in the creek act in a similar manner to that of the other streams. The next stream encountered is Brinker Creek, which is a short distance along the canal.

The canal from Porter Creek to the tunnel has a carrying 1682 capacity of 275 feet per second of time. It is proposed to install spillways at Brinker Creek. Brinker Creek and Porter Creek are quite similar both from the standpoint of watershed and run-off. When the ditch is already filled to its full capacity of 275 cubic feet before it reaches Porter or Brinker Creek, any excess water coming down either of these two creeks will naturally flow over the spillways as it will be in excess of the capacity of the ditch. There will be times when these conditions will prevail during the high stages of water in the other streams. I am unable to give the exact 1683 duration of these different flows or the quantity that will thus pass over. From Porter to Brinker Creek the material is loose and solid rock. Portions of the canal rest on solid rock.

The canal is 25,300 feet in length from Porter Creek to the tunnel. There has been removed by construction of the canal, in this

division, 22,000 cubic yards of material, 20 per cent of which was solid rock. The amounts are 4,400 cubic yards of solid rock and 17,600 cubic yards of loose rock. The slopes of the mountain in this division are more steep than on the Nunn Creek division and are about the same as on the Deadman Creek Division. About

1684 75 per cent of the canal of this division rests on solid rock and boulders. The canal is considerably higher than the Laramie river at Porter Creek, although at the tunnel the elevation of the ditch is only 50 feet above the bed of the river. Small

1685 creeks and ravines are encountered throughout this division.

These carry water through some portions of the year. Waste gates are designed for installation at East Springer Creek in this division, also overflow sections have been designed. There will be times when the water from all sources of supply will be greater than this ditch can carry, in which event the excess will go over the waste gates and will be discharged directly into the Laramie river

1686 and by means of that stream will find its way into the State of Wyoming. There will be times when the side-hill drainage, that is run-off from melting snows and storms, will find its way through the canal in such large quantities as to overflow.

The excavation on this East Side Collection Ditch occurred largely between November, 1909, and October, 1910. As I recall the

1687 occasion of labor occurred after the commencement of this suit.

Am familiar with the McIntyre and the Rawah ditch, also the West Side Collection Ditch. The McIntyre ditch carries water from McIntyre Creek to Rawah Creek. It will be 2,500 feet long. A small ditch on a flat slope having its headgate near the headwaters of McIntyre Creek within two miles of the extreme headwaters of that stream. It will carry water from McIntyre creek over into Rawah Creek and the water will find its way from there down Rawah creek to the point of diversion of the West Side Collection Ditch.

Am familiar with Rawah Creek and point of diversion on that stream of the West Side Collection ditch. At the diversion there will be installed a dam, wasteway and an overflow section similar to the one to be installed at Deadman Creek on the East

1688 Side Collection Ditch. The first division of the West Side Collection Ditch extends from Rawah Creek to Rapid, a distance of 17,500 feet, and will have a carrying capacity of 200 cubic feet per second of time. The next division is from Rapid Creek to Fall Creek and has a length of 2,000 feet and a capacity of 250 feet per second. The third division of this West Side Collection Ditch extends from Fall Creek to Mill Creek, and has a length of 3,700 feet and a capacity of 270 cubic feet per second of time. The next division is from Mill Creek to the tunnel reservoir, a distance of 4,000 feet, and has a carrying capacity of 275 cubic feet of water per second. This division has been fully completed.

Included in the contract of September 8, 1909, between 1689 the District and the Company, the West Side Mountain Ditch is constructed along a very steep side hill mountain.



More solid rock is moved in constructing this canal than the one on the east side of the valley. All work thus far completed has been done with picks and shovels and wheelbarrows, what might be termed "hand work." It required a large amount of blasting with dynamite. The canals divide into four divisions. On Rawah Creek division there were 32,000 cubic yards of material moved, of which 16,000 was solid rock and 16,000 loose rock. On Fall Creek division there were 15,000 cubic yards of material moved, of which 4,500 was solid rock and 10,500 yards was loose rock. No work was done on Rapid Creek division, which extends from Rapid to Fall Creek. On Mill Creek division 18,000 cubic yards of material are moved, of which 6,300 cubic yards were solid rock and 11,700 cubic yards were loose rock. The terminus of the Mill Creek division is at the reservoir dam. All this work was pick and shovel work. In addition to the open ditch work there have been two tunnels driven on the Mill Creek division, the aggregate length of which is about 270 feet. These tunnels were necessary owing to the fact that the ditch at this point intercepted a cliff of 1690 solid rock. This perpendicular wall of rock is so situated as to make flume construction or open cut ditch out of the question. The expense would be too great.

A tunnel 750 feet long will be necessary on Rawah Creek division near Rawah Creek. Tunnels aggregating 690 to 700 feet will be constructed on the Fall Creek division. Total length of additional tunnels is something in excess of 1,500 feet. These tunnels are six feet high by eight feet wide. Work was done by hand drills.

Waste ways have been designed for installation along this West Side Ditch as designated in the original contract; one at Rawah Creek, one at Rapid Creek, one at Mill Creek and another at Fall Creek will be installed. At times there will be discharges

1691 of excess water over these waste ways.

Upper Rawah Ditch is surveyed throughout its entire length and is partly constructed. It intercepts some of the streams that are also intercepted by the West Side Mountain Ditch. All work performed on this ditch was done prior to the time I entered the employ of the District. This was the ditch first projected in the early history of the system by Mr. Akin and Wallace A. Link. I have been all over this line of ditch, both the constructed and the unconstructed portions. The capacity of this ditch is something like 200 cubic feet per second. This ditch was not to be completed for the District under contract of September 8, 1909, although in that contract the District acquired the ownership of that portion which had been constructed. The district proposes to complete the ditch. Water accumulated in its discharges into West Fork of the Laramie river. It flows down the West Fork into the tunnel reservoir and then through the tunnel.

Water of all these streams are carried from a northerly direction to a southerly point, back up the watershed in a sense.

Am acquainted with characteristics of water flow in Mill Creek.

There are times when it will carry considerably more than  
 1693 five cubic feet per second. Upper Rawah ditch does not interfere with the flow of Mill Creek. If this ditch was charged to its full capacity before reaching Mill Creek, all of the waters would go over the waste way. Water will discharge over spillways on lower Rawah Ditch or West Side Mountain Ditch at various times with flows of short duration. Overflow sections have been designed for installation along this canal. These waste-gates contemplated will be installed so that the high-water line of the ditch is at the same elevation as top of gates and also gates are designed so that they may be raised and discharge the water through these gates. The object of putting the top of the gate at the same elevation as the high-water line of the ditch being that any excess water will find its way over the top of these gates and not go over the bank of the ditch.

West Side Mountain Ditch compares very favorably with the line of the Sky Line Canal. Both ditches being on same general slope of the Medicine Bow Range, on the west side of the Laramie river. Sky Line ditch is at slightly higher elevation than West Side Ditch.

West Side ditch has grade of from one and one-half feet per thousand feet to as high as three feet per thousand feet and the velocity of this canal is fairly great. Water will flow rapidly through it. This grade would be too steep in valley, but is good mountain grade. Waters flowing in these mountain streams are clear. From observations I have made on the Sky Line  
 1695 Ditch of the Water Supply & Storage Company, which canal is similar to the West Side Collection Ditch, I should say that there would be considerable seepage from the latter ditch along practically its entire length. It is impossible to determine amount until ditch is put in operation. This canal discharges its water at reservoir dam site just above the dam in the reservoir basin at the west portal of the tunnel. Its point of discharge is directly opposite the point where the East Side Collection Ditch discharges into the same basin. Tunnel reservoir embankment extends across the channel of Laramie river and across valley from East Side Collection Ditch to West Side Collection Ditch.

This dam is 1,893 feet long. 28,305 cubic yards of ma-  
 1696 terial have been placed in the embankment. Also 3,250 yards of concrete which go to make up the outlet tube in the bed and channel of the Laramie river through embankment for discharge of waters down river channel. This outlet is single tube with a double gate. It has, I believe, a five-foot arch with two and one-half feet rise and distance from spring line of two and one-half feet. Mr. Hedke designed it and it was put in under his supervision.

Three streams enter the Tunnel reservoir. Half Mile Creek, a small stream discharging very little water, the East Fork of the Laramie river and West Fork of Laramie river. East Fork  
 1697 of Laramie river is, in my judgment, a smaller stream than Deadman Creek. It discharges less water. West Fork of Laramie river is a larger stream than Deadman Creek. Less water

1698 is available from West Fork than from Deadman after the diversion of Sky Line Ditch is made. Have been along toe of slope of mountain below Sky Line Ditch and in many places have observed water coming down the small streams that are intercepted by it. Water also appeared along slope of mountain side itself where no streams occur. A considerable amount of water was coming from seepage and going back into Laramie river. Excess or overflow also occurs at the head of the Sky Line ditch. Have seen water passing over Diversion Dam of Sky Line Ditch and flowing down West Fork of Laramie. This same condition would undoubtedly prevail at both Rawah and Deadman Creeks on the Greeley-Poudre system. Water overflowing spillways would likewise go down Laramie river. Water overflowing spillway at Sky Line Ditch would go down to tunnel of Greeley-Poudre system.

1699 Material going to make up dam of Tunnel reservoir consists of rock, some earth and gravel in large quantities. In my opinion this reservoir will lose considerable water by seepage which will be lost to the District system of works. Seepage from this reservoir will be much greater than with ordinary reservoirs constructed on the plains. All these seepages, escapements and overflows, which I have mentioned, will find their way into the channel of the Laramie river below the diversion works of the Greeley-Poudre Irrigation District and will be lost to that system. There are no works in the watershed of the Laramie river in the State of Colorado which can divert water from that stream for use on lands in the Poudre-Valley and which can or do take out water at a lower elevation than those of the defendant district. It is impossible to construct works to take waters from that stream lower down the stream than are the works of the district.

Am thoroughly familiar with works of the District in Poudre Valley, also with work done since making of contract of September 8, 1909. Large amount of construction work has been performed. The Laramie-Poudre Canal has been completed from its head, at the eastern terminus of the Poudre Valley Canal throughout various portions along its entire course. This canal is divided into two divisions, so-called. First division extends from terminus of Poudre Valley Canal to point called Black Hollow Siphon, length 113,000 feet, being 1130 stations of 100 feet each. Second division of canal extends from east end of Black Hollow Siphon to point at Eastman Creek and has a length of 173,300 feet, being 1733 stations of 100 feet each. Material on both divisions of this canal were classed in contract of September 8, 1909, as enlargement. Enlargement being that portion of canal which had previously been constructed. In work of enlargement there were 216,970 cubic yards of earth moved, and 59,000 yards of solid rock moved after District entered into contract with Company. Am unable to state amount of material that had been moved prior to contract with District. Mr. Hedke can give these quantities.

1701 New work on canal consisted of excavation where no previous work had been done. 740,000 cubic yards of material

were to be removed, out of which 555,000 cubic yards of earth and 6,2000 cubic yards of solid rock have been removed to date. The siphon across Black Hollow consists of two parallel 7 foot steel pipes, resting and bolted to concrete foundation. Foundation is installed.

Now from Eastman Creek to McGrew Lake reservoir is known as Eastman Creek Inlet Canal. It is 30,600 feet long and was constructed prior to contract of September 8, 1909. 60,800 cubic yards of material were removed from this inlet ditch after signing of contract. At terminus of this canal McGrew Lake reservoir has its beginning. Length of embankment is 163 stations of 100 feet each. Embankment has maximum height of 25 feet and contains 405,000 cubic yards of material. 395,000 cubic yards of material have already been placed. Outlet tube is installed which contains 350 cubic yards of concrete. Reservoir holds water 38.4 feet in depth above bottom of outlet tube, and impounds about 858,000,000

1702 cubic feet of water, or approximately 19,734 acre feet. Top of embankment is 6 feet above high water line and the entire inside space will be paved with reinforced concrete paving with a coping wall one foot above top of embankment, making top of coping wall seven feet above high water line of reservoir.

McGrew Outlet canal extends easterly from McGrew Reservoir. It begins at outlet tube of reservoir and ends near Crow Creek, from which point Briggsdale lateral extends some twenty miles further on. Of this McGrew outlet canal, there has been completed 1060 stations of 100 feet each and there has been removed 212,000 cubic yards of earth.

Rock work excavated on Laramie-Poudre Canal was taken 1703 from large cut at west of Black Hollow. There remains 13,500 yards of rock to move in this cut. The cut has a length of 3,300 feet and maximum depth of 35 feet. Ditch has width on bottom of 27 feet with side slopes of one-half to one. There is another large cut known as Wellington Cut, situate north and west of Wellington, Colorado. It is through earth. It has maximum depth of 31 feet, is 20 feet wide on bottom and has slopes at point two feet above high-water line of two to one. Some rock has been taken from bottom of Laramie-Poudre Canal between these two cuts. From Wellington Cut to Poudre Valley Canal is all enlargement.

District has rights in canal constructed and in operation known as Pierce lateral, which is extension of canal of the Water Supply & Storage Company. Begins directly opposite Black Hollow Reservoir. From this point the Company's canal discharges into Black Hollow reservoir and takes water out of the reservoir from the bottom and runs thence easterly. Pierce Lateral extends around the reservoir on upper contour and runs eastward. This lateral

1704 is to be enlarged under contract of September 8, 1909. Waters of District to be carried through this lateral will be discharged into Black Hollow, a natural depression, from Laramie-Poudre canal. Waters will then be carried down Black Hollow to Pierce Lateral and through same to terminus where will be dis-

charged into a creek called Owl Creek. Point of discharge will be within boundaries of District. From this point waters will flow down Owl Creek and from thence will be diverted by the Middle or Central Lateral of the Greeley-Poudre District. This ditch will also be supplied in part from the Laramie-Poudre-Canal at point where said canal crosses Owl Creek. Waters carried by this lateral will be taken to point near the eastern side of District, and into

1705 Camfield Reservoir. This canal will be used to irrigate lands lying below its line between Owl Creek and the Camfield Reservoir and will also be used as filler for that reservoir. It will also be used to fill March reservoir. Waters discharged from this ditch for purpose of filling this reservoir will come in through Coal Creek. From point of discharge waters will be carried down Coal Creek a short distance to point where canal known as March Reservoir Inlet Canal will have its diversion. This canal extends from Coal Creek in a southerly direction to reservoir.

There is one canal extending from outlet tube of Camfield reservoir and serving lands below. From March reservoir there is outlet canal extending a short distance from point where canal divides, one branch of outlet runs thence eastward and one branch runs southwestward. This canal known as March Outlet Canal.

60,000 cubic yards of material have been placed in the March Reservoir embankment. No work has been done on  
1706 outlet or inlet canals. Inlet canal to March Reservoir is also to be constructed for diversion of seepage and flood waters flowing into stream.

Long prior to my employment with district there was ditch built from Crow Creek leading to Camfield Reservoir. This ditch still is in operation. The outlet gates or reservoir are constructed. It is natural basin having capacity of 175,000,000 cubic feet, without need of artificial embankment. Inlet from Crow Creek to Camfield Reservoir is about five or six miles long. It is a large canal.

These reservoirs, McGrew, March, Camfield, also Douglas and Cobb Lake, and the main canal of the system, and the long laterals which I have described, are to be employed for the diversion, storage, carriage and distribution of all waters obtainable for the irrigation of the lands of the District. Waters of Cobb Lake and Douglas Reservoir can be used by exchange. All Douglas reservoir water will have to be exchanged while the major portion Cobb Lake water can be used through canals of the system directly. Small portion will have to be exchanged.

By exchange I mean that water is supplied from this reservoir to owners of prior rights from the flow of the Cache la Poudre and an equivalent amount taken out at head works of Greeley-Poudre District at the river. This is the practice on the Poudre river and is in extensive use. For illustration, waters of Fossil Creek Reservoir are owned by ditches which lie above the reservoir and the water is exchanged by delivery into other canals and the water which these canals are entitled to is taken by the owners of the reservoir.

1708 The entire system of works which I have described was designed for the diversion, carriage, storage and distribution

for irrigation of all the lands of the District. The system includes the reservoir to be constructed across the bed and channel of the Cache la Poudre river. All water which can be obtained from all sources is necessary for sufficient annual irrigation of lands included in Greeley-Poudre District. The Channel Reservoir in the Poudre river will intercept all of the water that will be used by District. All water obtainable through or by means of whole system contemplated in contract of September 8, 1909, is necessary for District irrigation.

Dover Reservoir was not considered in contract of September 8, 1909. It was surveyed and built by District. It is situate across bed and channel of Lone Tree Creek, about five miles north of town of Nunn, and is a small reservoir. It is complete. Embankment contains about 40,000 cubic yards of earth. It is a flood. 1709 water reservoir. Lone Tree Creek, upon which Dover reservoir is situate, heads in Wyoming and flows through and into the State of Colorado. Waters of this stream are intercepted and impounded in reservoirs in Wyoming and used for irrigation of lands in that State. I have been informed that there are also ditches taking water directly from the stream in that State. If these waters were not diverted and used by the Wyoming appropriators they would naturally flow down the creek, into Colorado, and into this Dover Reservoir. They would also flow into the canal of the District and be used for the irrigation of District lands.

The same is true of Crow Creek, which heads in Wyoming and flows into Colorado. Along eastern border of district Crow Creek is a dry arroya for a greater part of the year. It sometimes 1710 carries flood waters. Inlet to Camfield Reservoir was designed and constructed for interception of these waters. This stream furnishes the water supply for irrigation and domestic use for city of Cheyenne in Wyoming.

The lands of the Greeley-Poudre Irrigation District will require all of the water contemplated to be obtained by the completed system of works for their irrigation. The system has been designed for diversion, storage and distribution of all water obtainable to 1711 accomplish the economic irrigation of this land.

On map attached to corporate defendant's answer figures showing elevations appear with plus mark at various points. These elevations were obtained by me from United States Geological Survey.

Elevation of Nunn, Colorado, is approximately 5190 feet. At beginning of second division of Laramie-Poudre Canal at Black Hollow elevation is 5197.29 feet. Elevation of McGrew Lake outlet is 5090 feet. From this point canal has gradual fall and elevation lessens accordingly.

Lands of Greeley-Poudre District are approximately five hundred feet higher than lands at Greeley. Slope is gentle. Trend of whole country in irrigated territory in District is similar, sloping to south.

I have indicated elevations on map of portions showing 1712 Laramie Plains. Elevation at Woods Landing is 7461 feet according to United States Geological Survey. Wyoming Experiment Station located near Laramie has elevation of 7187 feet.



Have been over Laramie River Valley from tunnel of the Greeley-Poudre District to Wheatland, Wyoming. Laramie river flows through what is commonly called Laramie Plains. These are broad level stretches of country having elevation of about 7000 feet and more, and dotted over with alkali basins and depressions. Whole plains are unprotected country and are in my judgment unfit for raising crops to any great extent. Soil on Laramie Plains is comparatively shallow and is soon worn out.

It is a fact that frosts occur very late in the spring. Professor of the University of Wyoming stated to me last spring that he had been at the Experiment Station for thirty years and that was the first month of August in which he had not seen killing frosts 1713 during the thirty years he had been at Laramie. On the other hand, the Cache la Poudre Valley is at an elevation of some 2000 feet lower than the Laramie Plains. It is in a well-known high state of cultivation and has been for a long period. Laramie Plains had facilities for transportation before Cache la Poudre Valley did. There is no comparison between two valleys.

I have been over portions of the irrigated territory situated under the work of the Wheatland Industrial Company and The Wyoming Development Company in the vicinity of Wheatland in the Laramie Valley in Wyoming. This was during inspection trip of the Valley that I made during fall of 1911. Was along Sybille Creek where stream is used by that enterprise for carriage of water in conjunction with its ditches. Visited intake of Ditch No. 1 leading from Sybille Creek to irrigated area in vicinity of Wheatland. Water was flowing in Sybille Creek at point of intake. Gates at head of canal 1714 were closed. Diversion dam at head of ditch for diversion of water from the creek was of no efficiency for that purpose. The water was going through the dam, it had been washed out. Water was flowing through the dam. The portion which I saw was composed of sticks and manure. I saw all that was there. A large portion of the water was going through where the dam had been washed out, some small quantity was going through and under. This was during fall of 1911. This is first point where waters from Sybille Creek are diverted into works of the Wheatland project. Water I saw was partly from Blue Grass and partly from Sybille.

Do not know quantity; about 20 to 30 cubic feet per second. 1715 On this trip saw reservoir that lies within body of irrigated land near Wheatland, known as Reservoir No. 1. It had water in it. Passed over inlet ditch to Reservoir. No water was flowing in it. I did not make an inspection of entire line of canals. I did not see any water flowing in the ditches at that time.

Each month during time work was being carried on in completion of the system of the Greeley-Poudre Irrigation District and prior to institution of this litigation, there were issued monthly estimates by the Board of Directors of the District. Upon these estimates 1716 bonds were paid over to contracting company for work done.

These estimates were issued continuously each month. Under them bonds of District amounting to two and one-half million dollars (2,500,000) were paid over. \$1,800,000 of bonds were paid by trus-

tee to Company. \$500,000 of bonds were deposited for taking care of and retirement of bonds of Company. The District still has on hand \$2,500,000 of bonds out of the original \$5,100,000 of bonds.

Am acquainted with the general character of the water flow of the streams that are tributary to Laramie river in Colorado. Tributaries entering river from west side which are not intercepted by works of Greeley-Poudre are a portion of McIntyre below present or contemplated diversion, La Garde Creek, Forrester Creek, Grace Creek, Stuck Creek and Johnson and Beaver Creeks. (These latter two streams head in Colorado but discharge their waters into the river in Wyoming.) All these tributaries which I have mentioned head in the Medicine Bow Range in the regions of perpetual snow and on high mountains. They are streams of constant flow. Stuck Creek is a much larger stream and with heavier flows than Deadman Creek. McIntyre Creek is one of the larger tributaries of the Laramie river. It is larger than Stuck Creek. La Garde Creek is a smaller stream than Stuck Creek and is about the size of Deadman Creek. Grace Creek is a fairly large stream at the time of

1719 freshets and discharges considerable water.

Streams on the east side of the Laramie river which cannot be intercepted by the Greeley-Poudre system are: Jimmy  
1720 Creek and Sand Creek, also Brown, Pete, Arroya and Lone Tree.

Sand Creek discharges quite a considerable supply of water from Colorado into Wyoming. I have seen the stream in heavy flow. At the times I observed it it was a larger stream than Deadman Creek. Jimmy Creek is a smaller stream than Deadman, although during freshets it discharges a considerable quantity of water. Some of the waters of Sand Creek are carried across the divide into Sheep Creek, in the Cache la Poudre Drainage, although the watershed thus diverted is comparatively small when considered with the entire watershed of the creek.

1721 I am acquainted with the vicinity of Woods Landing, in Wyoming. It is at the southern extremity of the basin known

1722 as the Laramie Plains. There are streams flowing into the Laramie river in that vicinity which flow constantly. They are Bear Creek, Woods Creek and Fox Creek. These drain area to the north of the Colorado boundary. I am not attempting to give the tributaries of the Laramie river in Wyoming. I have better acquaintance with the stream, its watershed and waterflow, and of the tributaries, at the upper reaches of the stream and particularly to the basin of the Laramie in Colorado. My experience has extended in this region during my service as engineer for the Greeley Poudre Irrigation District during the years 1910, 1911, 1912 and 1913.

CHARLES R. HEDKE, Civil Engineer:

Direct examination by Mr. Fred Farrar:

1723 Am a civil engineer. Reside at present at San Acacio, Colorado. I am especially engaged in irrigation engineering. Am at present affiliated with the project of The Costilla Estates De-

velopment Company. The Costilla Estates consist of land situated within an old Spanish land grant. It lies in the southern part of Colorado and some in northern New Mexico.

I am a graduate of University of Wisconsin, class of 1900, and following year went to Michigan and was engaged in work connected with the sugar factory at Holland, Michigan. Worked in civil engineering department with specialty of sanitary engineering, involving problems of water supply, sewage and sewage disposal.

1724 At Holland, Michigan, was in charge of chemical work of factory during night work. While there became acquainted with Kilby Manufacturing Company of Cleveland, Ohio, who were builders and contractors of sugar factories. In Spring of 1901 I came to Colorado with that company for the erection of a sugar factory at Loveland, Colorado, and was put in charge of construction with position of resident engineer and had to do with local problems of water supply, drainage, foundation, masonry construction, stone, concrete and brick in erection of buildings and installation of machinery and transportation and storage problems connected with beets.

That year the sugar company at Loveland started to build a feeder line for their factory: a railroad for transportation of beets from farmer to factory. That railroad is now called The Denver and Great Western Railroad. That is the railroad which now runs from Loveland in an easterly direction, one branch thence running south to Milliken and Johnstown and meeting another branch going across the watershed between the Thompson and Poudre Rivers, crossing the Colorado & Southern Railroad at Windsor, then easterly down the Poudre Valley past Severance and connecting with the

1725 Union Pacific Railroad at Eaton, Colorado. Work in connection with this railroad was performed by sugar company and I became closely connected with terminal of it at Loveland and became familiar with line projected through territory and business of construction. That work brought me in touch with agricultural conditions. The problem of water supply connected with the sugar factory covered investigation of ditch and reservoir sites in immediate vicinity of factory.

With completion of sugar factory at Loveland, I took up my duties in connection with same work at factory then in process of construction at Eaton in 1903. Eaton is in the northeasterly section of the Poudre Valley and about eight or nine miles north of Greeley. These special problems coming up in connection with that factory were those of water supply, which required a consideration of returned waters to a natural draw that was tributary to the immediate vicinity of factory, and history of that draw and its returned waters were of the most important consideration. While engaged at that factory I was also interested in the growing of 100 acres of beets, which brought me in contact with the farmers of the community and also the officers of the ditch companies and reservoir companies. Also considered transportation problems connected with handling of the beet crop. It was necessary in connection with this factory,

1726 to work out the storage or handling of beet pulp for feeding purposes; principally to cattle at that time. On completion of that work I was transferred to Fort Collins as headquarters and had under supervision construction of three factories in 1903: one at Fort Collins, one at Longmont, and one at Windsor. Had responsible charge of all three factories. This work brought me into consideration of many water supply problems of the valley, both at Windsor and Collins, and also on the St. Vrain.

These several factories I have mentioned are all for the purpose of manufacturing sugar from sugar beets. Their cost was considerable. The Loveland, Fort Collins and Longmont factories each cost a little more than \$1,000,000, while the factories at Windsor and Eaton, being a little smaller in capacity, cost about \$750,000 each. The factory at Greeley, Colorado, was built by another company but cost about the same as Eaton, \$700,000 to \$800,000. The company owning all these factories at the present time is The Great Western Sugar Company. They also own three other factories in the South Platte Valley, at Brush, Fort Morgan and Sterling, Colorado. Other than the last three mentioned, these sugar factories are within a radius of thirty miles, of which perhaps Windsor 1727 and Loveland are the center.

Every acre of sugar beets raised for these factories is on irrigated land. It would not be possible to raise sugar beets in Colorado successfully without irrigation.

Upon completion of these three factories in 1903 severed my connection with the construction company and entered private professional practice locating at Fort Collins. Engaged almost exclusively in irrigation construction and engineering. Constructed canals and reservoirs, outlets to reservoirs, detailed structures on canals and larger works of diversion dams and mountain ditches. My work required careful consideration of water supply of the valley, its expense and present and future development, value of water, which in turn covered problem of soil and character and amount of crops produced on the soil with the water. Also gave careful study to cost of production, net returns, markets and other factors entering into the general problem of irrigation and its economic conditions. My work in the years subsequent to 1904 1728 has led to necessity of investigation of many irrigation problems and in course of such investigations it became apparent from time to time that there were certain fixed matters in relation to these problems which would admit of a fixed system of analysis. This system is not yet complete but many features of it are just a natural analysis of conditions surrounding the development of irrigation. I made a definite study of such a system of analysis, for the purpose of being able to advise definitely upon any question or problem that might arise concerning irrigation.

My special work at present time is that pertaining to general problems of irrigation which follow actual construction, problems of operation and relation between detailed use of water by farmers and operation of constructed works. It covers the essential 1729 problems of economic use and distribution of water.

The Costilla land grant contains about 500,000 acres.

Present plans contemplate irrigation of 75,000 acres and actual reclamation of about 20,000 acres for year 1913. The system of works at present constructed cost in the neighborhood of \$2,000,000.

During time of my private practice of irrigation engineering at Fort Collins was associated in one way or another with almost every ditch and reservoir system in northern Colorado. Among the prominent ones for which I performed services are The Water Supply & Storage Company, which owns the Larimer County canal; The Larimer and Weld Irrigation Company, which owned the Eaton ditch, irrigating land around Eaton and Ault, Colorado; The Poudre Valley Reservoir Company, which had already constructed the Poudre Valley canal; the Divide Canal and Reservoir Company, which had under construction at that time the diversion of the system for the diversion of waters from the headwaters of Deadman and Sand Creek- tributary to the Laramie River; The North Poudre Irrigation Company, owning the North Poudre Canal diverting water from the North Fork of the Cache la Poudre; The Mountain Supply Ditch Company which irrigates land in the same vicinity as the North Poudre canal. The Mountain Supply Company is now absorbed by the North Poudre Irrigation Company. It originally owned canals constructed and in operation diverting water from the Michigan River, tributary of the North Platte, in North Park, Colorado. The water is brought across the divide from North Platte through Cameron Pass, a low point on the watershed between the North Platte and the Cache la Poudre Rivers. This water is then taken down the Cache la Poudre river and used on lands in that valley, largely under the North Poudre system by 1731 means of exchanges of water with the older canals in which the Company having the Michigan river diversion systems turn their water to the Divide Canal and Reservoir Company, and then they in turn give the former the water diverted from the Sand Creek diversion, which is a tributary to the lands the Mountain Supply Company were covering.

I also worked in connection with systems on the Big Thompson, Little Thompson, St. Vrain, and other streams and did some work in Wyoming in the neighborhood of Douglas and also some investigation in Texas, also on the Laramie Poudre system.

Constructed diversion works of considerable magnitude in Cache la Poudre river. One consisted of concrete dam across bed of river at head of the Larimer County Canal, including controlling works, all of which are built of concrete and steel. A very similar structure was installed at head of Larimer County No. 2 Irrigating Company canal, and also the head of the New Mercer Canal.

1732 These latter ditches head on the river four or five miles west of Fort Collins. They irrigate lands south of Fort Collins. Also constructed minor works, such as outlet works of the No. 8 reservoir system of the Divide Canal and Reservoir Company, several dams and outlet works in connection with the system of The Mountain Supply Ditch Company, and enlargement of Clark Lakes and construction of concrete rip-rap on that lake. No concrete rip-rap-ping of reservoirs had been constructed in Colorado at the time of in-

stallation of that on Clark Lake. It was the first constructed in this State so far as I know. The usual method of rip-rapping reservoirs for the protection of the dams was by means of loose rock placed upon the slope of the embankment on the water side. In this particular instance the rock was not easily available, was expensive and of poor quality. We decided to use gravel and make a concrete rip-rap covering the entire face of the reservoir dam to a thickness of six inches, reinforced with steel wire. This consists of paving the interior slope of the reservoir with reinforced concrete.

1733 That system of rip-rapping reservoir embankments is almost universally used at present time in northern and eastern Colorado. This work which I placed on this reservoir might be considered the pioneer in that line of construction in Colorado.

At time I first became acquainted with Poudre Valley in 1901, the general development had passed through the period of application of water directly from the stream and even through the period of reservoir development, which supplemented the direct supply from the stream, and was just entering into the period of maximum development with relation to flood waters. The agricultural development was of a very high type, and the development with relation to irrigation construction and use of water was also of high type. Irrigation had been practiced in that valley for perhaps 40 years. It was and had been of the nature that brought large returns and made a wealthy community. There were several cities in the valley having considerable population for agricultural communities.

1734 They had good schools, excellent transportation facilities and a reputation for products that was known all over the country. I refer particularly to the reputation for potatoes grown in the valley and the by-products of agriculture, the feeding of sheep and cattle in northern Colorado. This development had progressed until it was considered of the very highest in the state, if not in the west.

The section of the valley near Greeley, Eaton and Ault, is noted for its potatoes. The product is generally known in the commercial world as "Greeley Potatoes." Valley also had a very extensive reputation for the feeding and finishing of lambs for market. Alfalfa was particularly used in this industry. Commencing about 1900 the cultivation and production of sugar beets progressed. The Valley at that time had advanced to a very high state of development, in so far as it had been possible to reclaim the land by the then existing irrigation systems. It was considered a model for

1735 many parts of the country. There yet remained a considerable area of land in the northern and eastern parts of the valley that was still arable, but not irrigated. The area was perhaps two or three times that actually irrigated at that time. There were several hundred thousand acres of such land. The arid lands situate immediately adjacent to the then irrigated lands were of a very similar character. If anything, the arid lands were of a little better quality because the larger portion of the area was to the east and northeast of the then irrigated area and the soil of this arid land was of a little finer texture and its physical features were, perhaps



even better than those then irrigated and which were more immediately adjacent to the stream. The arid lands being bench lands were more of a uniform character than those previously irrigated.

The values of irrigated lands in the Cache la Poudre valley were quite uniform. This land is all in a high state of cultivation, with good improvements and water rights of almost equal value, so that lands anywhere in the Poudre Valley have values from \$100 an acre to \$250 per acre, depending slightly upon proximity to railroad stations, cities and a few conditions of that kind. There was a decided advance in the general values of the lands in the community at the time of the introduction of the sugar factories.

The primary need of the valley in 1900 and immediately thereafter, and for all time in the future will be the problem of securing water, and its application to lands of the valley which are still unreclaimed. The maximum use of the water will always be attempted. The most striking illustration of the practical expression of this need of the community is that of the construction of the Poudre Valley Canal of The Poudre Valley Reservoir Company's works. That project had its inception the latter part of the 90's, in about 1898 or 1899. In 1900 or 1901, there was constructed a large canal which had for its purpose utilization of the flood waters of the Cache la Poudre river. This canal was constructed through a very difficult and dangerous country for ditch construction. There were several available reservoir sites to the east of the point of diversion and this enterprise was commenced and the money was obtained from the farmers of the Cache la Poudre Valley for the enterprise. Many of the owners of lands under existing canals were interested in this development, and they believed at that time that there 1737 was sufficient water to justify the expense.

The canal is located at the upper reaches of the valley and at the point where the river leaves the mountainous country. It is the highest canal that has its headgate on the principal stream. The headgate is located about twelve miles above the city of Fort Collins. The construction of this canal entailed an expenditure of two or three times as much money as was first thought necessary. \$600,000 was expended in the construction of the first sixteen miles of the canal and all of this money was obtained from the farmers of the Poudre Valley. The system was never entirely completed. The development covered such a large territory, in order to justify the initial expense of construction, that it was difficult to reconcile the water supply with the quantity of land to be irrigated. The available water supply was never really ascertained and it was impossible to interest the necessary capital to complete this work without a further supply of water from that which was apparent at that time.

I mean a greater supply of water than the Poudre River was 1738 able to furnish. Great difficulty was that there was not sufficient water in the Poudre River for the irrigation of the lands contemplated in the plans of the projectors. The original purpose of that canal was to obtain the flood waters in the river, or rather, the peak of the flood. Canal was very large and required such construction in order to handle that class of water supply. The

lands proposed for reclamation were immediately adjacent to and above the irrigated section of the valley reclaimed by the Larimer County Canal. The Poudre Valley Canal is now a part of the system of works of the Greeley-Poudre Irrigation District. To sum up my statements, the need for irrigation of lands in the Poudre Valley at that time not under irrigation caused the construction of the Poudre Valley canal in 1901. The available water supply was found insufficient to irrigate the lands the reclamation of which had been contemplated. Those lands are the same as those now included in the Greeley-Poudre Irrigation District.

Direct examination by Mr. Delph E. Carpenter:

Became acquainted with those who were projecting the Poudre Valley Canal while I was living at Eaton, Colo. By living in their community and meeting them, we frequently discussed the construction of this canal. I also learned the needs of the community, the hopes and aspirations of the projectors with relation to this proposition. This was in 1902. In 1904, when I took up the general practice of engineering at Fort Collins, I became identified with the property directly. That year was one of great floods in the Cache la Poudre river. The works constructed by The Poudre Valley Reservoir Company were not as yet seasoned. The canal was badly crippled by the excessive floods. I was employed in reconstruction of canal. That portion of canal immediately below head-gate had been damaged and also the portion on the steep hillside close to the valley. The great floods had more than filled the canal and had overtopped its banks and washed out large sections. These sections were situated on steep hillsides and the material was of a treacherous character and difficult of reconstruction. It involved some special and new problems along the line of construction. Core-walls were installed to strengthen the high fills. The previous alignment of the canal made reconstruction where the sections were washed out very difficult, requiring loose rock construction and concrete toe walls, and even concrete lining was considered for some of the sections. I had the designing and supervision of most of these repairs. This included reconstruction of the headworks and a large fill across the Hook and Moore draw, and the facing of that fill with concrete rip-rap. Also construction of overflow sections and regulating gates for floods a short distance below that draw. Also repair of sections of canal between that point and Shipp's Hill and the draw immediately adjacent thereto. Also several sections in the vicinity of Dry Creek north of the Douglas Reservoir. During that time I became even more familiar with the entire system and its details.

After building first 16 miles of this canal, the farmers were unable to go further for reasons I have already given. The farmers' company was known as The Poudre Valley Reservoir Company. The Greeley-Poudre Irrigation District is the successor of that Company. This District has continued the efforts of those farmers. The Poudre Valley Reservoir Company had completed

the first 16 miles of the Poudre Valley Canal and the Douglas Reservoir. They contemplated the construction of Cobb Lake Reservoir and commenced a small portion of work in that construction. Douglas Reservoir is situate beneath the canal and just a little above the then terminus. Waters stored in this reservoir have to be utilized by means of exchange system practiced in the Poudre Valley. This exchange permits the Company owning water in this reservoir to deliver the same into canals below the reservoir and take out an equivalent amount of water from the stream at the head of the canal, which

water in turn is run through the canal and used for the irrigation of lands irrigable from it.

The distribution and diversion of water generally in the Cache la Poudre is one great system of exchanges and inter-exchanges. The administration has developed a means of changing and exchanging and inter-changing water so as to bring about the most economical and maximum use of the waters of the river.

I was associated with The Laramie Poudre Reservoirs & Irrigation Company in a professional way. I was also connected with its predecessor, The Laramie Reservoirs & Irrigation Company. I was also connected with The Laramie Tunnels, Ditches and Feeders Company, a partnership, as I understood it, which was the predecessor of The Laramie Reservoirs & Irrigation Company. This Laramie Tunnels, Ditches and Feeders Company was commonly known as the Link and Akin Company.

My first acquaintance with the Laramie River Valley was in 1904. At that time investigation was made and work performed upon a system of diversions for the Divide Canal and Reservoirs Company in the summer of 1904 at headwaters of Deadman Creek. This work

was construction of the old Wilson Supply Ditch. This work made me familiar with the Laramie Valley.

My first acquaintance with the Greeley-Poudre Project in the Laramie Valley was in 1904, when there was under consideration a diversion of water from the Laramie River to the Cache la Poudre river by means of a tunnel. The matter was brought to my attention and discussed. Persons working on the project consulted me at that time. I began active operations in connection with that system in 1905. Made some personal and extensive investigations in connection with the project.

My work in 1905 consisted of a general analysis and special detailed surveys as a means of applying the water from the Laramie river to lands in the Cache la Poudre Valley, and also work in connection with the settlements between the contractors and the owners of the Laramie River system, upon work done on the Laramie river system in the year 1904, upon the unit of the Greeley-Poudre system now called the Rawah Ditch. It is sometimes called the Upper Supply Ditch, and is situated on the west side of the Laramie river valley at an altitude of about 10,500 feet, and work had been done the year previous and the contractors were forced to go out of the country on account of the snow, and final and complete estimates were not made that year but were completed and made by me in 1905. This

required me to go over that work already done in great detail for purpose of estimate.

1744 The work performed to that date was of a very good character. Very good class of mountain ditch construction. Between 4,500 and 5,000 feet of mountain ditch construction had been completed at that time. There was considerable solid rock and loose rock material, not perhaps very heavy construction. There had been actual construction done before I became associated with the project. A considerable amount of such work had been done; roads were built to the works, clearing had been done to a great extent, necessary preliminary work had been performed. The 1904 work had progressed under the direct supervision of Mr. Zac T. Duvall, an engineer of Denver, Colorado. In 1904 some work had been done by Mr. R. Q. Tenney, of Fort Collins, prior to the time that Mr. Duvall was employed.

In 1905 I found a road constructed from the Valley of the Laramie proper, up the West Fork to the work outlined, and to Rawah Creek, which is in a very rough section of the country, and involves a difference in elevation of about 2,000 feet in two or three

1745 miles. This was a very heavy piece of road work. There was also a road constructed from the State Road to the north of this property. This road was constructed from the State Road in a southerly direction to the upper end of the Rawah system in the neighborhood of McIntyre Creek and the Rawah diversion. It was about seven miles long. The principal obstacle that had been encountered in the construction of that highway was the heavy timber, both green and fallen. Several sections of that road were constructed through a burnt timber district, in which the trees had fallen and it was required to clear that and remove the boulders from the surface, thereby usually permitting a pretty good road to be constructed. These two roads penetrated a country which in fact had never had even trails previously. It was a country ranging in elevation from 8,500 to 11,000 feet, and even higher elevations. It was in the region of perpetual snow and was very wet during the summer time and required many structures of corduroy to make the roads passable over swampy places. The construction of these roads was an absolute necessity before beginning active ditch construction, as there was no other means of getting into the country. It would be impractical to pack materials, tools, machinery and supplies that would be necessary for the work contemplated in that region.

1746 The region thus penetrated by these roads is one of short working seasons, lasting from July 1st to October 1st out of the year. Sometimes the season is even shorter than that, depending on the snowfall and the character of the spring, which causes heavy thaws and a greater run-off. From October 1st snow storms are frequent and snow gets very deep and it is impracticable and impossible to do any such work. This canal is very close to timber line. The region above the line of this canal has peaks above an elevation of 13,000 feet and is the region of perpetual snow.

I found the first work upon this system and in this inaccessible

region performed. There had also been considerable surveying and clearing and other work done on the system preceding that time.

In 1905 I found then surveyed and in process of construction the system of irrigation works afterwards constructed. It was substantially the system as it exists today, that is, the main features 1747 are the same. The details have been worked out in somewhat different lines and some changes of a slight character have been made, but in the main the system is the same. I found the tunnel line located and surveyed.

The final line of the tunnel was placed on exactly the same line that I found surveyed in 1905, after all possible other considerations had later been taken into account. That was the line of the Duvall and the Tenney surveys. The collection ditches of the present system were substantially outlined at that time. Minor changes, due mostly to the size and character of the enterprise and the existing conditions, and also brought about by a better class of construction than originally contemplated, have been made. The system as a whole is the same for all practical purposes. As an example of the slight departures made, I will state that the system of collection ditches on the west side was designed to catch water on that slope from the drainage area, and on account of physical obstacles it was then proposed to take the water across the valley in a pipe line. These difficulties 1748 were great cliffs of rock, very heavy construction and some very dangerous. I discarded the idea of the siphon line across the valley and substituted a tunnel on the ditch. A tunnel was projected in place of the siphon and a continuous ditch was constructed along the west side for the purpose of diverting and carrying that water. There were several tunnels on that line.

These tunnels vary from 100 feet to 800 or 900 feet in length. 1748 Tunnels are substituted for siphons. Are more permanent. These changes made no difference on diversion of water, object was just the same.

Other than time I have mentioned, the major portion of my time was spent on this enterprise on the plains, in 1905. The relation of the plains work to the Laramie river work was that of working out the details connected with the work of distribution and application of that water to lands in the Poudre Valley. It was work on the same general project, in fact, it was the lower end of the same project, the distribution end. Diversion without distribution would be of 1749 absolutely no value. This plains work was only a portion of the same thing, one is as essential as the other. If no distribution were provided, the water would flow down the stream and be wasted or taken out by other appropriators who would furnish distribution.

During 1905 the Company was preparing itself for expensive financing necessary to development of this project and such work was performed as could be done with the means at hand. It was impossible to work in the mountains during winter months, due to heavy snow in that locality. Impossible to get in and impracticable to do work. Work was always going on somewhere in connection with the project, it never ceased. It was continuous. The Company

was also considering at that time its relation to other companies on the river and negotiations were going on between various companies and this Company for the purpose of obtaining the works of construction and rights and water of various companies involved and considered in this development, with object of merging. It was found necessary to merge several of these properties into one to make a practical proposition.

1750 Wellington Hibbard was the main man at that time in promotion of this proposition. His entire time was given to it. He had active and personal charge of the enterprise in all its phases, financially and otherwise. He made several trips to Chicago, St. Louis and Omaha during that season. He was constantly spending money towards completion of project. He was killed in connection with this enterprise while making a trip to the tunnel in the year 1910. His services had been continuous, and his entire time had been given to the project from the time he first associated with it until the time of his death. He had no other business.

Other individuals were associated with Mr. Hibbard in his work and gave it their constant efforts. I had responsible charge of the engineering and was Chief Engineer from 1907. Prior to 1907 my work with project was more in nature of occasional consultation in necessary work connected with it, and with detailed work. Was out on the works and often in charge, but at that time under another engineer.

1751 In 1905 and 1906, we considered almost every piece of property on Cache la Poudre river in connection with this system, and surveys were made in these computations. Lines of distribution, water supplies, lands to be irrigated, and how the system could be used in connection with other systems for distribution were considered; necessary surveys from reservoirs and lands, several of which went as far as the Crow Creek country east of the Union Pacific Railroad. Other work was done in connection with system at upper end taking into consideration group of reservoirs then belonging to The North Poudre Irrigation Company and its relation to this system.

This involved surveys for the different reservoirs and computations were made as to capacity and cost of incorporating them into general system. Also investigated possible supply from Big Thompson and Boyd Lakes, to ascertain possibility of utilizing this water by exchange methods with Cache la Poudre Valley and its system. Conducted further investigations of Eastman Canal and Reservoir Company. This was later absorbed into system. It constitutes that portion of the Greeley-Poudre system known as the McGrew Reservoir and its inlet canal, now a portion of the Greeley-Poudre canal. It was the portion of work located directly east of Nunn, a distance of seven or eight miles. This Company had also completed outlet tube to lake which is now called McGrew Reservoir. The inlet that was then completed consisted of that portion of the Greeley-Poudre Canal that extends from Eastman Creek into Reservoir, a distance of seven or eight miles.

There are examples of work which was generally going on during



that time. The works were numerous and entailed a very careful consideration of large number of systems of Cache la Poudre valley. Expenditure of money on the system was constant during years 1905 and 1906, principally along lines I have mentioned. During those two years there were employees on Laramie river in charge of project.

As another example of work that took place during years 1905 and 1906, the matter of diverting water from Laramie River watershed into Cache la Poudre watershed was considered and investigation was made as to other means of diverting this water outside of the tunnel then surveyed and contemplated. Investigation was made to divert the same water by means of canal and other works of similar character, around the watershed to the north, extending into Wyoming and across the divide between the Poudre and the Laramie at a point known as Fish Creek Divide, near Tie Siding, in Wyoming.

In connection with development of an enterprise as large as the Greeley-Poudre, involving large expenditure of money, it is always necessary and customary to investigate every possible means of accomplishing the same general end by the cheapest and best means. Any idea that suggested itself was thoroughly investigated and reported upon.

1754 In 1907 upper unit of Laramie River portion of works, known as Rawah unit was extended and surveys were made in connection with the canals and works of that entire unit. The work covering the largest expense was in connection with the Upper Rawah Ditch, upon which considerable work was done that season. The entire season was used with all the men that it was possible to get up there and as high as 100 were employed, the nature of the work being such that it was impractical to employ more men than that.

In beginning of season 1907 labor conditions were favorable, men were hard to get in a region of that kind, work was plentiful and after considerable negotiation along those lines finally some foreign labor was used in construction.

The usual method of going at that class of work is by first getting into the region in any possible manner, oftentimes by foot or on pack horses, making a preliminary survey, seeing whether it is possible to divert certain waters over or through certain places for delivery at a certain point, and upon finding that that is possible, rerunning such lines and making them more definite and permanent.

1755 After this follows the work of clearing. Consideration of snow obstruction makes it necessary to clear a wide strip for construction of such ditches and this work is usually through very heavy timber. After clearing is done lines are rerun and cross-sections made for the actual beginning of excavation. Details of such construction usually involve the task of obtaining best possible results from material at hand. It involves preparation of face of bank, leaving the finer and more impervious material on the inner side. Where hillsides are very steep it is often required to have means of holding loose material and larger material, which has tendency to roll to bottom of slopes and which is often required for

support of embankment. It is necessary to put in rock cribs and loose rock retaining wall construction to make a good class of work.

Roads are necessary before heavy work of excavation is commenced. Construction of roads required use of large amount of tools, machinery, powder and supplies and expense of material in these localities is oftentimes very great.

Cost of transportation of materials from supply station at base of mountain on the Laramie river to the Upper Rawah Ditch was as great as cost of transportation of material from Ft. Collins or Laramie to this supply station. The distance in the first instance is seven miles, while in the latter instance it is 65 or 70 miles. The 1756 principal reason for the difference of this condition is the grades to overcome, the difference in elevation being about 2,000 feet in three or four miles, and requiring six horses for hauling of ton of material.

We had a fixed wagon freight rate from Fort Collins and Laramie to the supply station on Laramie River, located in immediate vicinity of junction of the East Fork with the West Fork of the Laramie. The rate was \$1.10 per 100 lbs. to that point, with \$1.00 per hundred from there on to the construction camp at the Upper Rawah. Fort Collins, Colorado, and Laramie, Wyoming, were nearest railroad stations. Laborers were taken up at same rate as freight; they were weighed and hauled by weight.

1757 In 1907 there was completed on Upper Rawah Ditch the section of canal from its discharge into the West Fork, intersecting Fall Creek and Rapid Creek, around the divide between Rapid Creek and Rawah Creek to a point in the neighborhood of Camp Lake. Clearing and surface work was done as far as Camp Lake. Several hundred feet of excavation was opened up at the upper part of this clearing, but snow stopped work and parties were obliged to cease just as snow found them so that certain portions of upper line were not entirely completed. Work was done on upper Rawah Ditch in 1908. Measuring weir was put in, ditch was opened up and water run and there were several men working up there all through summer. In 1909 and 1910 a small force of men was employed on that ditch, but not as large as in 1907. Between 1758 1904 and 1910 inclusive, there was expended about \$47,000 in construction on Upper Rawah Ditch.

Conditions surrounding labor in the locality were such that it was very hard to keep them there when labor was scarce. They stay a short time and usually want to get out quickly. We employed a system of making it financially attractive to those who would stay an entire season by increasing pay at end of time and all laborers were taken up there with understanding that if they would remain for a certain time their transportation would be paid out.

In 1905 and 1906 diversion of this water from Laramie River and its effect upon the stream and interests along river were investigated by me. Data was collected and brought into shape, hydrographs were made of the flow and computations made of supply available at the various points of diversion for the best design of works and other information of general value obtained. This work in-

involved expenditure of money, largely in office force. It continued entire time we were employed on river. We considered matters of hydro-electric development and like subjects. No especial hydrographic work was done by company at their own expense but records of state of Wyoming, State of Colorado and the U. S. Geological Survey were all considered and consulted and used in connection with system. Also considered appropriations of ditches then constructed from Laramie River in Laramie Plains region,—their size and other factors.

In 1905 and 1906 surveys were made in connection with general project to verify wisdom of building tunnel. Investigations of every possible means of diverting water were carried on. Laramie River Reservoir was surveyed in connection with survey for purpose of ascertaining feasibility of diversion of water from Laramie River drainage through the reservoir and an outlet canal from it in place of tunnel and collecting ditches. Had this plan been feasible we could have eliminated all construction of mountain ditches and tunnels. It would have resulted in construction of reservoir in channel of river, collecting all water above it and supplying it into a canal below. This canal would carry water around divide into North Fork of Cache La Poudre River. Preliminary survey for this was first made in 1905 merely to ascertain conditions surrounding two watersheds. Definite location survey was made in 1906 for this and completed October 1. A heavy snow storm at that time covered country to depth of perhaps 36 inches making a continuation of work impossible.

1761 The result of this survey in 1906 was that it was impracticable to build this canal and the company decided upon the construction of the tunnel as the only means of diverting that water.

In 1908 another investigation of this means of obtaining water and avoiding building tunnel was carried on. In that year a complete survey was made and George C. Anderson of Denver, a consulting engineer, was taken over the entire line and a report made. This detailed survey and investigation confirmed the former views and report and confirmed conclusions the Company had reached in 1905 and 1906. It required a ditch of about 100 miles in

1762 length with obstacles of every possible nature, steep hillsides, unsuitable material, broken and disintegrated rock, and conditions were such that under ordinary ditch construction, water turned in at head of canal would undoubtedly be lost before it reached lower end unless canal were lined. Many tunnels were necessary; also siphons and flumes, and character of country required special construction for almost the entire length of canal. That means of diverting water was entirely abandoned after that time. It would have cost about \$30,000 per mile and 100 miles of that canal would make the cost beyond consideration.

1763 Several different tunnel sites were considered and their relations to the collecting ditch system. Different elevations of the collecting system, different lengths of tunnel, different means of regulating water into tunnel and such investigations and com-

putations as were necessary to weigh and balance the various propositions and find the one most economical and best suited for conditions of development, were considered and surveys made to ascertain the facts.

As a result of all these investigations I am of opinion that the system of works of the Greeley Poudre district now in process of construction on Laramie river represent the final development for diverting water from the Laramie River watershed in the State of Colorado. There is no possible way of diverting any more water from the Laramie River at a point lower down and conveying it over into the Cache la Poudre Valley. The topography of the country lying between the Laramie River Valley and Cache la Poudre Valley prevents this. One of the main reasons is existence of a spur of mountains making a secondary divide, the one upon which Sand Creek Pass is located, and any point below the present tunnel site gets into a country where the divide widens out so great that tunnelling is impracticable, and the only way to get around is by an open ditch or means similar to it. Thus a ditch could not divert water at any point below the Laramie River Reservoir because of difference of elevation between that point and the divide between the Poudre and the Laramie, which is about 225 feet, and which would be consumed in grade of canals conveying water. The drainage area contributing to such a ditch is but a few square miles more than that now drained by the Greeley-Poudre system; a little strip of land a mile wide and eight or nine miles in length. It is in the bottom of the Laramie River Valley. The area I refer to is that portion represented by white on the map Exhibit 1, appearing between the two colored portions of the drainage area of the Laramie river available to the present diversion system. The Laramie River Reservoir, of which I speak, was about three-fourths of a mile south of the point on the map marked Glendevey, and just about the point where township line crosses Laramie river as represented on map, north line of township 2 north, range 76 west. The ditch of which I spoke would discharge into the Cache la Poudre drainage area on divide indicated on map south and west of Tie Siding, Wyoming, about north line of Section 11, Tp. 12 N., R. 73 W.; between reservoir and this point this ditch would run entirely on north and west side of line indicating divide, beginning at reservoir, running parallel to Laramie River, getting into Wyoming in Tp. 12 N., Range 76 W., then coming into drainage area of Sand Creek and its tributaries and going back into Colorado, crossing Sand Creek Valley almost parallel to brown line indicated on Exhibit 1 as ridge between Laramie drainage area and Poudre drainage area, at distance of about six miles from crest. Ditch line would be very crooked. It would be of character indicative of general topography of mountain country through which it runs. With Greeley-Poudre system operating, the amount of water obtainable through such a canal would be very small.

1766 I do not think it would be possible to take out a ditch or a tunnel line to divert water at a lower point on Laramie river. The tunnel sites are certainly prohibitive, not less than six miles in

length and the many miles of open ditch work would lose the entire flow of the drainage area.

My conclusion was and is that the Greeley-Poudre tunnel is the only means of diversion between Laramie river and the Poudre. It represents the final economical development for purposes of diverting water from Laramie drainage to Poudre drainage.

Surveys of Laramie reservoir were completed, but it was separate and apart from the system commonly called the Greeley-Poudre system. It was surveyed and mapped as a subsequent and junior enterprise. It was surveyed sometime in November, 1906. Rights of way were later purchased and owned by Company doing 1767 the Greeley-Poudre development. Later, those in charge of construction of a system in Wyoming—The Interstate Reservoir Company—interfered with the development and construction of this reservoir. This was after our survey. The Company consisted of F. C. Grable, F. S. Wendelken and some parties at Laramie, I think Mr. Bell was connected with it. They made application to National Government for rights of way which interfered with our work. We considered it was a proposition that would not be necessary in contemplation with our system and abandoned it for the time and no further steps were taken to perfect that portion of the work. There was some controversy over the dam site and the location of the section corner there. A careful survey showed that two sets of section corners existed along that township line, partly overlapping the sections of one township over another, and controversy arose as to the exact location, and upon whose property the dam site was located. It finally worked out that some rights of way were obtained by the Wyoming people from the government. This resulted from the overlapping of these section lines.

The work performed on upper Rawah ditch during 1907 was a part of the general work going on over entire system. There was other work going on at that time on plains division. That work opened up about April 1, 1907. Prior to April, 1907, plains work was generally outlined and a definite location with cross-sections marked. Purchase of rights of way was commenced in 1907 and actual excavation was commenced immediately after.

In 1905-06 there was a plan of financing the development by which money was to be raised from contracts to deliver water to land owners in the territory now known as the Greeley-Poudre Irrigation District, by issuance and sale of bonds of Company, and a considerable amount of money was obtained and spent through that plan of financing. Part of money thus obtained went into Upper Rawah Ditch. In the spring of 1907 active operations on excavation began on plains, rights of way were purchased and arrangements were made with various enterprises which were to be linked up with this system. Construction work was done on not less than 30 to 35 miles at various points. It was impossible to get rights of way at some places and condemnation proceedings were commenced and construction work had to proceed at intervals along line, thus making continuous ditch impossible. Work was carried on through entire year of 1907. A large amount was done,

principally in the vicinity of Wellington, Colorado, and a little to east. All to east and along the line of the extension of the Poudre Valley Canal. That is same line of canal commonly known as Greeley-Poudre Canal. It is indicated on Exhibit 1 by red line along north border of colored area and to west of such area indicated by red line. It is the upper canal of the Greeley-Poudre system.

1770 General construction went on over the entire system of which I have spoken. Work on plains was that of ordinary earth work construction of the vicinity and the outfits usually consisted of men and teams with fresnos and slips, and at that time we had an elevating grader and steam engines for pulling. Had two of these outfits on this line of canal. There were six or seven team outfits averaging 15 to 20 teams per outfit. Three and four horses were used on fresnos, and two horses on slips. There was some rock excavation requiring use of powder and materials were taken out with carts and stone-boats.

This work continued entire year of 1907 and into year 1908. It continued after we had ceased labor on Upper Rawah Ditch in fall of 1907. The force employed on the Upper Rawah Ditch on Laramie River division, when compelled to come out on account of weather conditions, continued the work on the plains division.

1771 In fall of 1907 financial panic interfered to some degree with finances of Company. To overcome the situation there was issued by Company obligations called script, which obligated Company to pay same out of first moneys derived from sale of bonds of Company in future. About \$50,000 of such indebtedness was incurred. It was all used in keeping up work on system after October, 1907. Its full value was received in work upon system after panic. In 1907 some work was done on Mitchell Lakes, which are part of system located on Poudre river drainage. This was small compared with expenditures on other portions of system.

In 1907 and 1908 \$129,572.00 was expended on actual construction on the system, in addition to overhead expenses. That was all expended in construction of the Greeley-Poudre system. The experience of 1907 required re-financing but there was a little work done in 1908.

1772 In 1908 work was done on Upper Rawah Ditch and some work done on plains. About \$25,000 was expended in 1908 on the work. In that year a financial reorganization took place as the result of the panic of 1907. This reorganization terminated in the organization of the Greeley-Poudre Irrigation District. An irrigation district was organized under the laws of the State of Colorado which issued bonds upon lands embraced within the district and a contract was made with the parties then owning the system of works contemplated for the reclamation of that land, for completion of system from Laramie and Poudre rivers and for payment of work and properties in bounds of district. The total bond issue was \$5,100,000. Contract was for payment of \$5,000,000 in bonds to Company. Payment was to be made to our Company, The Laramie-Poudre Reservoirs and Irrigation Com-



pany. The work was designed in detail. A contract was made and work immediately commenced on the final completion of the enterprise and the development of these properties.

System of works on the Laramie river division or portion provided for completion in this contract was substantially the same as contemplated when I first became acquainted with the system in 1904. Variances were absolutely those of detail. No features of any importance, having any essential differences in amount of water or character of construction or extent of construction were involved. It was the same system upon which my employers had been spending money during the years following 1904.

I have heard Mr. Wortham's testimony concerning details of the Greeley-Poudre Tunnel, power plant installed to make that construction possible, the dimensions, capacities, &c. of the collection ditches and general description of works. It is substantially correct.

The tunnel unit includes control works, approach cuts and outlet construction. There was about \$600,000 expended on this unit.

More active work on the collection ditches on Laramie river side was closed down during my time as engineer. The tunnel work continued after that until it was completed. I severed my employment with the Laramie-Poudre Reservoirs and Irrigation Company in February, 1911. I have since been upon the works a number of times. Have done a little work in connection with the property since that time. Am familiar with the work up to date.

1774 About 42% of entire West Side collection ditch is completed on Laramie river. About 30% of East Side Collection Ditch is entirely completed. There are other portions of these ditches that are partly completed. The percentage of this latter work is based upon amount of money that it would cost to finish it and amount it cost to do work that has been done. It is not percentage in feet, but percentage in actual money necessary to complete.

The difficult portions of West Side Collection Ditch are complete. The easier portions are to be done, with exception of one or two tunnels. West Side collection ditch has been very heavy work.

Of East Side Collection Ditch the greater portion yet to be completed is what is known as Porter Creek division. The Deadman and Nunn Creek divisions are practically done. The crews

1775 at work on these two collection ditches were stopped about October 1, 1910. Some tunnel work was continued during winter of 1910 and 1911 under special arrangement. It was not settled at time I left employment of Company. I am not exactly posted as to how much was done.

Primary cause of shutting down work on ditches was lack of money to pay contractors. Money had to be obtained by sale of bonds of irrigation district. The suit or threatened suit of Wyoming against the State of Colorado interfered with the sale of bonds. Death of principal member of bond house interfered. Failure of several other irrigation properties and general decline of irrigation securities also interfered.

I am not personally familiar with extent to which Wyoming offi-

cials had been interfering with the sale of these bonds through various channels. I had heard of it and was advised of it and certainly saw the results of it at the time. I was familiar with the activities of one Francis C. Grable in that regard.

1776 Work and expenditure of money upon the system now known as the Greeley-Poudre system was continuous and uninterrupted from 1904 until February, 1911, at the time I severed my connection with the Company. It was done under some difficulties and conditions that showed remarkable progress for those conditions and difficulties.

The difference in time required to construct a system like the Laramie River diversion system, compared with one constructed on plains region near transportation might be explained thus: Laramie River system is in a region inaccessible; supplies, etc., must be hauled by wagon. Material encountered is of character much harder to work than that upon plains and cost is many times more and from the nature of things surrounding that class of construction, it is impossible to do that work in anywhere near the same time that similar work is done down on the plains. Shortness of working season in mountains creates an obstacle in the way of speedy construction. The character and class of workmen required usually employed on such work must be found and there is much loss of time in beginning of each season's work on such construction. Working season closes early in fall. That necessitates entire abandonment of forces when work is shut down and reorganization in spring.

1777 I might illustrate the difference between time required to build a mile of mountain ditches as compared with a mile of similar canal in plains districts by difference of cost. A ditch of same capacity on plains as our mountain ditches would cost in the neighborhood of \$1,000 per mile. Up in mountains it would cost \$30,000 per mile, and a mile of plains ditches can be built in a matter of several weeks, while a mile in the mountains may take a year, taking nearly all the men you can get on that mile to do it in one season's work. Work can be carried on throughout the entire year on the plains. Mountain construction entails a certain knowledge of handling that class of material, requiring powder and drilling, and consequently a class of men that are more experienced and expert in that work. Ordinary labor obtained for driving teams on plains ditch construction is impractical on mountain ditch construction.

Am familiar with Sky Line Canal of The Water Supply & Storage Company, its history and construction. The Sky Line Ditch was contemplated and under construction for several years and has been under reconstruction almost continually since, covering a period from 1890 to present time.

1778 Ditches on Greeley-Poudre system have been designed on somewhat different lines than Sky Line Ditch, and although it is not to be expected that troubles will not arise, they have been guarded against as much as possible in that construction, and with reasonable care in operating they should give very little trouble, and

yet they have been under construction for a fewer number of years. Much more work has been done on system of Greeley-Poudre than on the whole Sky Line Canal.

When we found finances would be limited for completion, the consideration of whole work involved determined the necessity of continuing work on tunnel and discontinuing it on other portions of enterprise, so that tunnel was continued and finished while the remainder of the work was discontinued. Tunnel may be considered most important unit of the system. It is the means of diverting water through the divide between the watersheds and is very important. Tunnel completed August of 1911.

1779 Average rate of progress on tunnel compares favorably with any tunnels built in this or foreign countries. Rate has even been considered as almost world's record. Conditions were very favorable to quick construction with plenty of power and fairly good materials.

\$1,825,000 had been expended on Greeley-Poudre system at time I severed connection with enterprise. This was cash. In bonds it would represent a considerably larger figure. Bonds had to be negotiated at less than par.

In 1905 and 1906 and other years I made series of investigations concerning available water supply for Greeley-Poudre system on Laramie river. Net results and conclusions were that we could not divert by that system more than twenty-five per cent of flow of that river at inter-state line. This did not include the run-off of such tributaries as Johnson, Beaver and Sand Creek-, which enter the stream proper north of the state line.

1780 During the years I was connected with enterprise I formed general conclusions as to relative agricultural values and development of two areas, Laramie Valley and Poudre Valley. The matter of relative values of agriculture was carefully considered from the very beginning. Cache la Poudre Valley was a section well known and its values readily obtainable. Results obtained from application of water in that valley were increasing from year to year and net crop returns from irrigation were such as to warrant expenditure of money that would justify getting water from remote places at high cost.

General agricultural conditions on Laramie Plains were studied, crop results and returns were investigated and general conclusions reached from all investigations, that water was worth many times more in Cache la Poudre Valley than in Laramie Valley. Results show that principal use of water on Laramie watershed was for irrigation of meadows and production of hay with some agricultural development at lower end of valley. In upper reaches hay and pasturage was principal use of water.

1781 By careful analysis it seemed that about one-half ton of hay per acre was obtained on Laramie Plains from irrigated meadows. That has value of from \$6.00 to \$8.00 per ton, making gross return \$4.00 on Laramie Plains. This was figured from the basis of hay production. Growing of other agricultural products had

been attempted there, but had not amounted to anything. Were very expensive and at no time showed any very promising results.

Climatic conditions of Laramie Plains area was such as to almost exclude all of grains and other grasses than native grasses. Wheatland area was not taken into consideration so very thoroughly on account of conclusion we reached that there was plenty of water for that area from the stream after the total diversion had been made.

In the Cache la Poudre Valley crop returns have been growing from year to year. The sugar beet industry made a great difference in values and growing of onions, cabbages and such products has increased values considerably.

Perhaps an average comparison of the two areas might be taken on the hay production, gross return of \$4.00 per acre, while the returns from the various crops in the Poudre Valley would give a gross crop return in the neighborhood of from \$30 to \$35, many products even much more than that, beets always yielding more than that, cabbage as high as \$400 to \$500 per acre, and the same is true of onions.

In the Cache la Poudre Valley grains produce regularly and uniformly; alfalfa production is from three to four tons of weighed dry hay per acre. Market conditions of the Poudre Valley give prices considerably higher than those on the Laramie Plains, even for similar products.

1782 In arriving at agricultural values of the two areas, both gross and net returns were considered. I believe the net crop return values should be considered. There is always an element of cost of production that varies from section to section, which should receive consideration. Assuming that the same character of cultivation would be required for any highly cultivated agricultural crops raised in either valley, the cultivation in Wyoming would undoubtedly be more expensive. The soil conditions are somewhat different, labor conditions are different, the care and character of its distribution works are different, and the amount of water applied would make some difference; it would be a little more in Wyoming than in Colorado.

It takes considerably more water to irrigate an acre of native hay under Wyoming methods than it does to irrigate an acre of cabbage in the Poudre Valley. The Wyoming methods are of a continuous nature, turning on the water when the conditions seem about right, and allowing it to run upon the meadows for a long period, taking off the water, permitting the ground to dry up and then harvesting the crop. In the Cache la Poudre Valley the system permits of the use of water when absolutely necessary. An economical use of the water is thus obtained. In quantity the average is very low.

I think the duty of the water is more than double in the Cache la Poudre Valley than it is in the Laramie Valley, so that the amount of water it takes to produce a \$4.00 hay return from an irrigated acre of meadow in the Laramie Valley would produce as high as \$1,000 gross returns from cabbage lands in the Poudre Valley.

I would not class the Laramie Plains as an agricultural section.

We arrived at the conclusion that our diversion would work no in-

terference or damage to the Wheatland enterprise, nor to the Laramie Plains. Later constructions in the Laramie Valley verified my deductions in that respect.

1783 Cross-examination by Mr. N. E. Corthell:

I first came to Colorado in the spring of 1901, and was engaged in engineering work in connection with sugar factories until 1904, when I entered the general practice as civil engineer at Fort Collins, and continued in the same until the middle of April, 1913, when I engaged in southern Colorado and northern New Mexico. Since April, 1913, I have had nothing to do with engineering work in the Poudre country.

1784 From 1904 to 1907 I was not engaged exclusively with the Laramie-Poudre projects, but after that time practically all of my time was given to those matters. I entered upon this employment about April 1st, 1907, being engaged by the Laramie-Poudre Reservoirs and Irrigation Company, the reorganization occurring about that time, and this employment continued until February, 1911.

1785 After February, 1911, I did no field work on the Greeley-Poudre project, but from time to time I performed services as consulting engineer in computing costs and making reports. During the greater part of 1904 I was employed by the Poudre Valley Reservoir Company, which owns the Poudre Valley Ditch, the Douglas Reservoir, and a part of the Cobb Lake Reservoir site, my work being the repairing and the reconstruction of the Poudre Valley Ditch.

1786 The Poudre Valley Ditch did not serve any lands within the present Greeley-Poudre irrigation district. It was designed to serve the land that could be irrigated from a canal extending as an outlet ditch from Cobb Lake reservoir and lying east of that reservoir. The Poudre Valley Ditch was never constructed as far as Cobb Lake by the Poudre Valley Reservoir Company. It ended at Rocky Ridge, about 12 miles north of Fort Collins and 3 miles west of Wellington, where it discharged into a system of reservoirs owned by the North Poudre Irrigation Company, which owned a large part of the stock of the Poudre Valley Reservoir Company.

1787 This point was about 13 miles from Cobb Lake, the high water line of which is about 25 or 30 feet below the grade line of the canal.

No body of land was segregated to be irrigated from the contemplated extension of the Poudre Valley Ditch, and the plans with reference to such extension were not at that time very definitely worked out. I remember going over this matter with the men connected with the Poudre Valley Reservoir Company and they always considered that they would extend the upper line, and they kept that line up to the highest possible grade. The first development of the exchange system would be to extend that line, or if it were not

extended, a line from the bottom of Cobb Lake could be constructed to cover the extensive area.

1788 The stockholders of the Poudre Valley Reservoir Company were principally farmers in the neighborhood of Ault, Eaton, Windsor, and Fort Collins, and the North Poudre Irrigation Company itself. The stockholders of the North Poudre Company were land owners under that Company's system lying in the Wellington district. The North Poudre Irrigation Company owns several properties under the Fossil Creek Reservoir, and the North Poudre Reservoirs Nos. 5, 6, 7 and 9, which were remote from the lands to be irrigated, and which were used as a basis of exchange whereby the canal of the North Poudre Irrigation Company could take water

from the river at its headgate, furnishing water from these reservoirs to those with whom the exchange was made. The interest which the Greeley-Poudre Irrigation District has acquired in the project of the Poudre Valley Irrigation Company, was acquired in this way: In 1908 the Laramie-Poudre Reservoirs and Irrigation Company acquired from the North Poudre Irrigation Company a large part of the stock of the Poudre Valley Reservoir Company, and purchased enough outside stock to acquire the controlling interest, and this controlling interest was transferred to the Greeley-Poudre Irrigation district by the general contract of 1909 with the Laramie-Poudre Reservoirs and Irrigation Company. The irrigation district has acquired further interest in the Poudre Valley Reservoir Company by making certain concessions to the minority stockholders, but how far that deal has progressed I do not know.

1790 The irrigation district is related to the Laramie Tunnels, Ditches, and Feeders Company, through this same general contract of 1909.

Aside from my work for the Poudre Valley Reservoir Company in 1904 I did work upon matters which finally entered into the project of the Greeley-Poudre Irrigation District in the way of consultation in March, 1904, with Mr. Tenney, the engineer who made the first surveys on the tunnel, and during the summer

1791 of 1905 I did considerable work in the way of going over various properties and ascertaining their relations to each other and to the new project, and making some detailed surveys, one being of reservoirs 5, 6, 7, and 9, and determining the area of lands the outlet from those reservoirs and from Cobb Lake Reservoir would cover. Some of this work was performed for the Link Lakes Company, and some for that Company when reorganized, and known as the Laramie Reservoirs and Irrigation Company. The men interested in these companies were Wallis A. Link and A. I. Akin, who were interested in the Link Lake reservoirs in the Laramie Valley.

1792 The work I did in 1905 for the Laramie Reservoirs and Irrigation Company was the investigation of the distribution end of the system, and of the plans and the examination of the work performed in 1904 in the mountains, which I went over in order to make a settlement of the contract for that work. The work



on the distributing end was in connection with the reservoirs near Wellington.

1793 In 1905 I went over the work which had been done in the Laramie Valley the preceding year, all of which was on the upper Rawah Ditch under the direction of Mr. Duvall. There was no construction work done in the Poudre Valley in 1905, and the investigation of reservoirs near Wellington was the only work performed in that year, outside of the Laramie Valley, excepting the work of financing the project. If there was any construction work in the Laramie Valley in 1905, it consisted in road building and camp building, but I do not know whether there was any such work.

1794 I do not know of any work that was done in the Laramie Valley in 1906, and I do not remember any work on the plains that would be considered actual construction work in 1906. In 1907 there was considerable work done upon the upper Rawah Ditch in the Laramie Valley. In 1904 this ditch had been commenced, the work being done at its lower end, and in 1907 the ditch was constructed towards its upper end, three miles.

1795 All of the work was upon this line of ditch and none upon the lower Rawah Ditch, sometimes called the West Side Collection Ditch. About forty or fifty thousand dollars was expended in 1907 on this work, this amount perhaps including engineering work in the Laramie Valley, but the amount expended for such engineering could not amount to more than two or three thousand dollars. The books showing these expenditures are not accessible to me, so that I must testify from memory. The work upon the upper Rawah Ditch was continuous, but I

do not know how many stations it covered. There was no other construction work in the Laramie Valley in 1907. In that year there was considerable work in the Poudre Valley, in the extension of the Poudre Valley Ditch. The Laramie-Poudre Reservoirs and Irrigation Company having acquired the carrying interest in the Poudre Valley Ditch, although not a stock interest in the Company, built several sections of a proposed extension of that ditch to the town of Nunn.

1797 The total expenditure in 1907 was \$129,000. I would say that the amount expended on this extension work was about \$70,000, this covering only construction work. Several separate sections of the proposed extension were completed, and some sections were not worked upon on account of the lack of right-of-way. It was for this work that scrip to the extent of \$50,000 was issued at the end of the season.

1798 The construction work in the Laramie Valley in 1908 consisted of the completion of some small portions of the upper Rawah Ditch. We had a small number of men up there all summer, but I cannot say how many were employed nor for how long. I do not suppose the amount expended for that work exceeded several thousand dollars. Some incompleated sections of the ditch were finished, loose boulders and slides were taken out of the ditch and overflow sections made and a measuring device was put in and some

clearing was done. No other work was done in the Laramie Valley in 1908, and I do not believe that any work has been done upon the upper Rawah Ditch since that time.

1799 In the Poudre Valley the work of 1907 continued through the winter and into the spring of 1908, and in that year some work was done on the Black Hollow Cut on the Greeley-Poudre Canal. I do not remember how much money was spent for construction work outside of the Laramie Valley that year. It was largely paid in scrip. All of the work that was done was on the extension of the Poudre Valley Canal.

1800 No construction work was commenced in 1909 prior to the making of the contract between the Greeley-Poudre irrigation district and the Laramie-Poudre Reservoirs and Irrigation Company. Appropriations were then made for the construction of the tunnel. Camps were built and a power plant was built, and a few days after Thanksgiving Day or about December first, 1909, actual construction work commenced on the tunnel. I am not able to recall definitely, but I believe that some work was done upon the ditches in the Laramie Valley in 1909.

1801 Construction work was commenced on the East Side Collection Ditch in the Laramie Valley in 1910, commencing about May first, I believe, as early as the men could get in. Work on the West Side Collection Ditch had commenced before that time, and I believe they worked upon tunnels along that ditch some time during the winter of 1909 and 1910. The roads were kept open so that supplies could be carried in for that work, and there were perhaps 30 or 40 men engaged in it, and I believe that force was maintained throughout the winter, supplies being hauled in from the railroad in Wyoming, about 65 miles, I believe.

1802 The work on the East and West Side Collection Ditches continued until October 1st, 1910, and I believe a little was done after that date on the West Side ditch. It is not true that a large part of the construction work was shut down about June

1803 15, 1910. Work on the west portal of the tunnel was closed down about that time, but not upon the ditches.

Direct examination by Mr. Delph E. Carpenter:

1804 I wish to correct and make clear the date of incorporation of the Laramie Reservoirs & Irrigation Company, which was incorporated on September 18, 1906. Statements heretofore made by me relative to work done upon this property about that time, referred to work done for individuals or an association of individuals that were not under any corporate name, the work covered all of that done prior to this date, and was done for individuals. These individuals were Wallis A. Link, A. I. Aikin, Wellington Hibbard, Myron Akin and Jesse Harris. Mr. Hibbard was the managing member of these individuals, putting in all his time and managing the affairs of the association. He was later manager of The Laramie Reservoirs and Irrigation Company. I worked under the same direction.

The Laramie-Poudre Reservoirs & Irrigation Company was incor-

porated March 19, 1907. Mr. Hibbard was the manager and directed the work in that company. Mr. A. I. Akin continued to render active service under all three of the associations or companies. Mr. Wallis A. Link was also active with Mr. Hibbard in the association of individuals prior to September 18, 1906. He directed the mountain work.

Cross-examination by Mr. N. E. Corthell:

1805 The work was pushed in 1910 on the mountain system with all the men that could be obtained, and was closed down on October 1st, 1910, after which time work was performed only on the east end of the tunnel, excepting for the construction of several hundred feet of tunnel work upon the West Side Collection Ditch, which was performed by a few contractors in the winter of 1910-11. In February, 1911, I severed my connections with the Company and no more work was done under my supervision and observation.

In 1910 the Company was proceeding with the construction in the Poudre Valley, upon the extension of the Poudre Valley Canal. The working force was being increased from time to time so as to reach a rate of construction work amounting to about \$200,000 per month, and in May, 1910, we reached an expenditure of \$160,000 a month, and were ready to increase it to the desired amount in June, when we received orders not to put on any additional force. No decrease was made in the working force in June, but we then received orders to lay off parts of the force as separate sections of the work were completed.

1807 There were about sixteen or eighteen sets of contractors at work in May, and these were gradually cut down until about one-fifth remained on the first of October.

1808 In 1910, \$45,000 was expended on the work upon the West Side Collection Ditch and the Laramie Valley, and \$38,000 on the East Side Collection Ditch. Prior to October, 1909, all the work that was done in the Laramie Valley was done upon the upper Rawah Ditch, and all that was done in 1909 or later was upon the lower West Side Ditch and the East Side Ditch. The reason for this was that in the early course of this project it was thought necessary to secure some current revenue immediately, and in 1906 a carriage right through the Skyline Ditch, and the construction work on the upper Rawah Ditch was undertaken so as to secure a property from which this current revenue could be derived, through the ten year period in which the major system would be constructed, but in 1909 the general contract was let which provided for the immediate construction of the whole system which would result in an immediate revenue so that it was no longer necessary to carry on the upper Rawah project. The idea leading to its early construction was abandoned, but the line itself was not abandoned, it being still intended under the general contract of 1909 to complete that work.

1809 The upper Rawah ditch may be considered an extension of the Skyline Ditch, and was originally planned to collect

the water from above the ditch and deliver it into the Skyline Ditch, for the purpose of assisting in the development of the larger proposition on the Laramie. It was only a means to an end. It would carry it over the watershed into Chambers Lake. The surveys were made with this end in view, and also with the end in view to use the upper Rawah Ditch to carry water into the west fork of the Laramie River above the tunnel whenever the tunnel should be constructed.

1810 It would have been unnecessary to construct the upper Rawah ditch if the Boulder Ridge project had been constructed, for the water from the watershed above the upper Rawah Ditch would have naturally reached the Laramie River reservoir from which the Boulder Ridge Ditch was to run, extending down the Laramie valley into Wyoming, and around Boulder Ridge into the Poudre Watershed. The water collected by this Laramie River reservoir if it had been constructed, would be from substantially the same watershed as is taken care of by the East Side and West Side Collection ditches, now being constructed, the difference being comparatively unimportant.

1811 The upper Rawah Ditch, if completed, would drain a watershed containing from ten to twelve square miles, which is about one-sixth of the area drained by the system now under construction.

The Greeley-Poudre Irrigation District was planned in the latter part of 1908, and organized on April 3, 1909. It was not during the course of this organization that the plan to take the water from the Laramie valley and distribute it upon the lands in the irrigation district was definitely adopted, the district being merely the outcome of the previous efforts, and embracing the same territory and the same works which had always been under consideration.

My examinations in the preceding years were not to determine where the water could best be applied, for this was the only available tract of land of any size in the Poudre Valley upon which it could be applied, and the problem was to work out the best and cheapest means to irrigate and develop that piece of land, and my investigations were directed to that end.

My investigation of Boyd Lake was for the same purpose. Boyd Lake is almost on the top of the divide between the Big Thompson and Poudre rivers, being south of the Poudre, and has a supply ditch from the Big Thompson. My examination was made to ascertain the feasibility of constructing another supply ditch from the

Poudre River which could be used to carry flood waters  
1813 from the Poudre with perhaps surplus waters from the Laramie, into Boyd Lake, discharge these waters from Boyd Lake into Fossil Creek, and deliver it from Fossil Creek to early appropriators upon the Poudre, thereby securing an exchange right which would enable the Irrigation District to take water at its intake, to which the appropriators supplied from Boyd lake were otherwise entitled. The waters stored in Boyd Lake could not be carried directly to the lands of the Irrigation District and would be utilized by a system of exchange.

1814 Most of the lands of the Irrigation District are actually east of the divide between the tributaries of the Poudre and the tributaries of the South Platte below the Poudre, although all of this area is considered as part of the Poudre Valley because it is irrigated from the Poudre.

A somewhat detailed investigation of the use of water and of the agricultural conditions on the Laramie Plains was made by me, beginning in 1905 and continuing until perhaps 1908, being completed before the organization of the irrigation district, and the commencement of work upon the East Side and West Side Collection ditches and the tunnel.

1815 In my testimony yesterday I considered that the term "construction work" includes engineering investigations, the survey and running of lines, clearing necessary lines, and the analysis of all of the work done and its relation to the entire project. The general investigation of the work necessary and the relationships of the various companies and their respective properties were all necessarily considered as well, and attention was necessarily given to such regulating works as the McGrew Reservoir and the March Reservoir, and all of this, I believe, is necessary in order to make a final enterprise out of the proposition.

1817 In addition to the construction work which I have mentioned as being performed since 1904, the engineering work in the field with often times as many as four parties, the office investigations and classification of data, the financial efforts of Mr. Hibbard and his associates, were going on continuously and practically all the time.

1818 They had a supply of water and the general plan of working out that problem of supply and a general, natural and inevitable place to put that water. The problem was the connecting up of the two ends of an irrigation system, viz., supply and use. In this particular instance, in a highly developed country with many previous enterprises, it resulted in the problem of requiring the gathering of many enterprises having the same general end, into one large enterprise.

The area possible to irrigate, when this enterprise was originated, was much larger than that now embraced. There is much more available land than is included within the Greeley Poudre Irrigation District. It was natural to investigate and get all the water possible, including rights initiated and principally carried out on the Cache la Poudre, those initiated and carried out on the Laramie River and all their constructions and extensions. In an enterprise of this magnitude, it was necessary to have certain data in order to satisfy persons interested in it, both as to the nature and character of the water supply, which required investigation, and obtaining of data relative to the water supply in the Laramie River. Trips were made to show conditions of areas from agricultural standpoint, amount of water flowing in the streams, and a general investigation of the water supply of the two areas.

1819 The Irrigation District has sources of supply other than from the Laramie River, and in 1907 some work was done

to make such other sources available, by constructing the Mitchell Lakes and reservoirs, which were developed as a small system prior to 1906 by individuals, and in 1906 by a corporation, which was absorbed in 1907 by the Laramie-Poudre Reservoirs and Irrigation Company.

1820 The Greeley-Poudre Irrigation District's system is divided into two general divisions, the "Mountain Division," and the "Plains Division," and by Paragraph 15 of the general contract of 1909 it was provided, "that the work of completion to be done by the Company, meaning the construction work, hereunder, shall be for the purposes of this contract be classified into two divisions, namely, "The Laramie River Division," and "The Plains Division," and each of said general divisions may and shall for the purposes of this contract and for the payments to be made hereunder be further divided both numerically and by name designated as herein-after set forth; and relative hereto, it is mutually understood and agreed that this contract shall be taken and held to be severable as to said mentioned divisions and sub-divisions hereinafter described as aforesaid, and not entire as to the whole; and the Company shall be paid for each part of the contract, payment upon the entire contract price for construction work as set forth in the following schedules, and if work as described in schedule No. 1 shall be completed and sold to the District, then that schedule shall be followed; and if the works described in schedule No. 2 shall be completed and sold to the District, then that schedule shall be followed; provided, that upon each monthly estimate upon any of the uncompleted portions of the works to be completed and sold to the District hereunder there shall be paid to the Company 85 per cent of the estimate thereon for work done and materials furnished during the month upon which such estimate is based, and the remaining 15 per cent shall be retained until the completion of the works upon which such estimate is made, and the amount to be estimated and paid shall be such amount as the value of the amount done shall bear to the total amount to be done upon the work upon which the estimate is based." In the schedules subjoined to Paragraph 15 of the contract, the Mountain Division is given as being composed of forty-six different units distributed among the following classifications: West Side Ditch, East Side Ditch, McIntyre Ditch, Tunnel Reservoir, Link Lakes Reservoir, Laramie River Tunnel, Mitchell Lakes Reservoirs, rights of way and clearing thereof.

1821 The Plains Division in this schedule consists of units numbered from 47 to 117 inclusive, distributed among the following classifications: Poudre Valley Ditch, Laramie Poudre Canal, McGrew Reservoir Outlet Ditch, Pierce Lateral, Central Lateral, Enlargement and Extension, Nunn Lateral, Larimer County Ditch Enlargement or Reservoir Lateral Ditch, March Reservoir, McGrew Lake Reservoir, Reservoirs Nos. 5, 6, 7 and 9, Cobb Lake Reservoir, and Camfield Reservoir.

This system has two distinct and independent sources of supply; that from the Laramie River and that from the Poudre River basin and the tributaries of the South Platte, and it was so designed that



the Poudre Valley Canal could divert water from the Poudre River and also from the northern tributaries of the Poudre intercepted by the canal and from the tributaries of the South Platte as far east as Crow Creek and intercepted by the canal wherever there was surplus water. We estimated that the amount of water available outside of the Laramie River source would be between 80,000 and 100,000 acre feet per annum as an average.

1822 It was reported to the District by Prof. Carpenter, who was employed to make a report upon the water supply, that there available from the Laramie River from 70,000 to 100,000 acre feet, from the Poudre River from 60,000 to 90,000 acre feet, from Doudy lakes, being of the Mitchell Lakes group, 2,990 acre feet, from Douglas Reservoir, 5,833, from flood waters of the Lone Tree and Crow Creeks, 3,000 to 10,000 acre feet, making a total of from 142,000 to 179,000 acre feet.

The Poudre Valley Canal diverts water from the main Cache la Poudre River, in Section 15, Township 8, Range 70, and is designed, with its extensions, to carry all of the water supply to the lands of the Greeley-Poudre Irrigation District. Its point of diversion is such that it can divert all of the surplus waters of the Cache la Poudre River, the Big South Fork and its tributaries, the Little South Fork and its tributaries, the North Fork and its tributaries, and the other tributaries of the main stream above the point of diversion. It also intercepts and collects the waters of Hook and Moore Creek-, Park Creek, Box Elder Creek, Sand Creek, Coal Creek, Rattle Snake Creek, Lone Tree Creek, Little Owl Creek, Robinson Creek, Owl Creek, Eastman Creek, another Coal Creek, Wild Horse Creek, another Sand Creek, and Crow Creek, as well as all other unnamed creeks and channels west of Crow Creek draining a portion of southern Wyoming and all that portion of northern Colorado lying north of the Poudre River and within its drainage basin, and also that portion of northern Colorado and Wyoming lying north of the South Platte River and west of Crow Creek.

1823 My estimate that the system as at present designed would divert approximately 25 per cent of the run-off of the Laramie drainage basin in Colorado, is not based upon independent investigation, but upon the published reports of the state engineers of Colorado and Wyoming, and of the Geological Survey relating to the flow of the Laramie River near the state line, and to the flow of the streams and creeks intercepted by this system.

1824 In making this estimate, I have not taken into consideration the Plaintiff's Exhibit M, but assuming that the facts as therein shown that the run-off at Glendevoy was 38 per cent of the run-off at Woods in May and June, and was 49 per cent of the run-off at Woods in July, August and September, I do not believe that my estimate would be changed, as there is a run-off from the watershed during the rest of the year, and the amount available at Glendevoy is not equally the same as is available for the system. In my estimate I was considering the amount available at the outlet of the tunnel.

1825 The Collection system can be operated from about April first until November first; some years it may be a month earlier or a month later at either end of the season, and the tunnel itself can be operated throughout the entire year, the direct diversion through the tunnel being about one-fourth of the total, this direct diversion being the water from the entire watershed above the junction of the east and west forks, except the diversion by the Skyline Ditch. The mean period of diversion for the entire system would be from about the first of May until the first of October.

1826 The percentage of the flow of the Laramie River above Glendevey, which would not be diverted by the present system, would be small, being the flow from nine or ten square miles in the bottom of the valley. Assuming that the records of the stream for 1911, 1912 and 1913 show that approximately 85 per cent of the run-off at Glendevey occurs between May first and October first, I still think that the percentage of the flow of the stream that would be diverted by this system would be about 25 per cent.

The length of the tunnel is 11,368 feet, and the contract price per linear foot for excavation was \$32.50. In giving the cost of the tunnel, I included the necessary plant and equipment, the approach cut and control works at the inlet end, and the control works at the outlet end. The plant which was built by the company cost about \$100,000, and has been dismantled and removed, the salvage being very small.

1828 Its cost is certainly part of the expense of constructing the tunnel. I included about \$15,000 or \$20,000 as covering, in my estimate, the expense of the approach cut, and \$8,000 as the cost of the control works at the inlet, \$5,000 or \$6,000 as the cost of the control works at the outlet, about \$5,000 for engineering expense and \$20,000 for the lining. A portion of these amounts has not been paid, about \$100,000, I think.

The plan is to divert the water of the Laramie River into the Poudre River, where it will run down to the Poudre Valley Canal, and through that canal and its extensions to the eastern limits of the Irrigation District, a distance of about 190 miles including the channel of the river and all of the works. When turned into the Poudre River the water passes under the supervision of the water officers of Colorado, who determine how much shall be diverted from the river into the Poudre Valley Canal after allowing for losses by seepage and evaporation which would not be much in the channel of the river, but which would be considerable considering the entire distance. So far as I know the state officers have never fixed any percentage as representing the loss of such water in the ditch. The managers of the Poudre Valley Canal have fixed a percentage of loss about which I am not just clear. The percentage has changed several times, and I believe has been different for different users. For small quantities of water I believe that deductions as high as 60 per cent have been made, this being for water diverted below the Michigan River ditch into Chambers Lake at the headwaters of the Poudre, and carried about the same distance as water would be carried from the Laramie River. This percentage

was fixed by the water commissioner in order to force the state engineers to make some definite investigation and rule, and I assisted in that investigation, which resulted in a final determination to fix the percentage of loss in the river channel at five per cent. From my investigations at that time it was also determined by the ditch companies interested that the loss in the Poudre Valley Ditch over a distance of 16 miles would be about 40 per cent so long as the ditch carried a small head of 40 or 50 second feet. With a larger head in the Poudre Valley Canal, the percentage of loss would decrease, and perhaps might become as low as 20 per cent for the sixteen miles, or even lower if the total capacity of the ditch were used. The water would have to be carried about 20 miles beyond this sixteen mile point to reach the average point of distribution in the Irrigation District. I would say the average flow in the Laramie River at Glendevey during the latter part of July, August and September would be about 75 second feet.

1832 An analysis of all the data available shows that about one acre foot of water per acre delivered at the land is sufficient for the proper irrigation of the land in the Poudre Valley, and this duty of water is several times higher than the duty of water on the Laramie Plains.

1833 In 1905 the plan of this project as previously made by Mr. Duvall was outlined to me and the system as constructed is substantially the same as was contemplated in that plan. The tunnel as constructed is on exactly the same line as was used by Mr. Duvall, at the west end, with a slight variation at the east end. I do not remember the location of the west end of the tunnel as located by Duvall by course and distance, and I do not have the maps by which to locate it. The final maps were never filed in the office of the state engineer, but there was no change on the location of the tunnel from the location shown on the maps filed in that office.

1834 From time to time, as surveys were made of different portions of the irrigation system, maps and field notes were filed in the office of the State Engineer, which represented the plans of the Company at the time of filing as proposed for each individual unit.

1835 It was here admitted, that the following maps, marked for identification, were true copies of certain maps filed in the office of the State Engineer of the State of Colorado: Plaintiff's Exhibit N, filed October 15, 1902, showing the Link Lake Ditch and feeders; Plaintiff's Exhibit O, filed May 9, 1904, showing the East Fork Ditch and reservoir; Plaintiff's Exhibit P, filed Oct. 6, 1904, showing the Laramie Tunnel ditches and feeders; Plaintiff's Exhibit Q, filed Sept. 24, 1906, showing the Laramie Tunnel, ditches and reservoirs; Plaintiff's Exhibit R, filed July 8, 1908, showing the Laramie River Reservoir; Plaintiff's Exhibit S, filed Sept. 28, 1908, showing the Laramie River, Sand Creek and Lone Tree Ditch.

Each of the projects shown on these maps, with the annexed statements, excepting that shown on Exhibit S, constitute a part of the

Greeley-Poudre Irrigation District's system. The project shown upon Exhibit S was investigated in connection with the system, but abandoned as not feasible, and it was not intended or proposed at the time the map was filed, to construct this Sand Creek Ditch, taking water from the Laramie River at the Glendevy Reservoir and carrying it north through Wyoming and south into the tributaries of the North Poudre. This ditch was abandoned when the map was filed. The ditch was investigated as an alternative to the Laramie River tunnel. Prior to the time this survey was made in 1908, we had made a preliminary number of investigations of this route, and we were satisfied that it was not practical, and this more complete investigation was made upon the demand of certain interests so as to absolutely satisfy the parties that this Sand Creek ditch would not be practicable. I believe that Mr. Camfield and Mr. Iliff, who with Mr. Shields were the principal parties interested in the Greeley-Poudre project, were the persons requiring this investigation.

It was here admitted, that six blueprints, marked "Plaintiff's Exhibit T," were copies of certain maps filed in the office of the State Engineer of Colorado, on Jan. 8, 1909, being a general map showing the systems of the Laramie-Poudre Reservoirs and Irrigation Company.

It was never intended to construct all the work shown upon these maps. The maps cover and bring together all the previous filings, and show all the different means of accomplishing the same general end—the irrigation of the land in the Greeley-Poudre Irrigation District. Many investigations were made to determine the best means of accomplishing this end, and these were incorporated in the various filings and in this map, which was the last filing made by the Company. Both the tunnel and the Sand Creek ditch, which runs through Wyoming, and the Glendevy Reservoir are shown on this map. It was known at the time the map was filed, that the cost of the Sand Creek ditch was prohibitive and that no possible relations could be brought about which would make it feasible. It was included in this map because at all times there were interests adverse to this system, the interests seeking to obtain some foothold in the Company, so that it was necessary to protect whatever was done by filings, so that if the matter should come up in the future there would be record evidence of what was at one time covered. It was not our purpose to use these filings to enable us to force any extortion.

The map filed May 9, 1904, locates the west or upper end of the tunnel, near the middle of the south line of the northeast quarter of the southwest quarter of Section 7, Township 8, Range 75. The map prepared October 6, 1904, by Mr. Duvall, locates the upper end of the tunnel, close to the middle of the east line of the same forty acre tract, and about 1,000 feet distant from the previous location. The first map filed by me locates the upper

end of the tunnel a little south and east of the middle of the west line of the northwest quarter of the Northwest quarter of Section 6, about a mile and a quarter from the location shown on the map filed October 6, 1904, filing map being file No. 5448 locates the west end of the tunnel about 1,000 feet to the north and west of the location shown on the map filed October 6, 1904. The tunnel was actually constructed on the line shown on the map filed October 6, 1904, and not on the lines shown on the subsequent maps, it being discovered that the location then made was better than the locations made in January, 1909.

1844 The survey represented on the map filed in 1902 covered only a part of the upper Rawah Ditch and the Collection ditches from the Link Lakes. On the map filed October 6, 1904, the West Side ditch was shown extending from the lower Rawah Creek only about two miles, and crossing the valley to the east side by a pipe or inverted syphon. On the map filed Sept. 24, 1906, the West Side ditch was shown as extended to connect with the tunnel site, and in the filing of January 8, 1909, the Tunnel Reservoir was added to this plan, the previous filings making no provision for a reservoir at that place.

1845 The changes in the Laramie River project were about as follows: The lines shown on the map of 1904 were extended to make a continuous ditch on the west side from the Rawah Creek, intercepting all the West Side tributaries to a point opposite the tunnel. Changes were also made in the design and capacity of the East Side Ditch, due to the changes made on the West Side, and it became apparent that a regulating reservoir would be the proper thing at the entrance of the tunnel, and this was incorporated as the Tunnel Reservoir, which in a large measure had the same function as the East Fork reservoir proposed in 1904. The East Side and West Side ditches would not have carried water to the East Fork Reservoir, but would have connected directly with the tunnel. From the standpoint of regulation it would make no difference whether the reservoir was at the tunnel or above it. The East Side and West Side ditches were not surveyed to enter the East Fork Reservoir, but it was planned to get water from the Upper Rawah Ditch into the East Fork, although this does not appear in the filings.

1846 The original plan of the Tunnel Reservoir contemplated a dam eighty feet high, the idea being that we would investigate the entire available site and then construct a lesser reservoir as other considerations might determine. The dam in the Laramie River was not built at the place shown on these maps, but was placed upstream at a point not shown on any filing. My plans provided for the 53 foot dam, but I do not know what size dam has been constructed. The plans were changed about 1911, when financial reasons made it necessary to cut down as much as possible on that end of the construction which would permit finishing later on without materially impairing the system.

## 1847 Cross-examination by Mr. John D. Clark:

The two major considerations in connection with this project were the water supply and the expense of conducting the water to the land. It was understood from the first that at least 125,000 acre feet must be delivered at the land, and reservoir facilities for about 100,000 acre feet were provided in the plans. This would permit sufficient storage to carry a considerable supply of water from a plentiful year into the next year, as the water could be carried direct to the land from the streams in the high water year without using the water in the reservoirs. It was contemplated that water would be diverted from the Laramie River from about the first of May until the end of the irrigation season in varying quantities, and sometimes perhaps much more than would be required for the immediate needs of the lands and at other times less, and the reservoirs were to regulate this supply. The water derived from the Poudre watershed would be taken during the flood water season, from about the first of May until the middle of June. It would be during that period that the water must be secured for storage in the reservoirs. At other periods of the year the prior reservoirs in the Poudre Valley would be taking all the water in the stream, and in the latter part of the season there would perhaps be a supply from the Laramie River which could be accumulated. The substantial flow which could be taken from the Laramie River would come at the same time of the year when the flood waters of the Poudre would be available for storage, so that the only period when it would be possible to divert water direct to the land would be the same period when water could be stored in the reservoirs, and it was for this reason that it was determined to construct a reservoir in the bed of the Poudre River.

1848 ing that period that the water must be secured for storage in the reservoirs. At other periods of the year the prior reservoirs in the Poudre Valley would be taking all the water in the stream, and in the latter part of the season there would perhaps be a supply from the Laramie River which could be accumulated. The substantial flow which could be taken from the Laramie River would come at the same time of the year when the flood waters of the Poudre would be available for storage, so that the only period when it would be possible to divert water direct to the land would be the same period when water could be stored in the reservoirs, and it was for this reason that it was determined to construct a reservoir in the bed of the Poudre River.

1849 No reservoir facilities of consequence were afforded in the basin of the Laramie River. The small reservoirs contemplated at the head of the Rawah Ditch would conserve only a small flow. These were natural reservoirs upon which it was proposed to do some work.

The basis of the project might be considered as the water diverted from the Laramie River, although in the final plans the burden was cast upon the watershed of the Poudre somewhat more than upon the watershed of the Laramie. The watershed of the Laramie was considered as very certain, whereas that of the Poudre is subject to change, and the numerous appropriations having priority over this project would lead to some uncertainty in connection with the supply of water from the Poudre River. The amount available from the small creeks entering the Poudre River from the north is uncertain, as these are very erratic streams, floods occurring in some years three or four times a year and then not at all for a period of years. The bulk of the expense of the project is attributable to the efforts to bring water from the Laramie River and to store it.

About October, 1909, Professor Carpenter was employed to make an exhaustive survey of the water supply, his employment coming



from the interests considering the purchase of bonds, I believe. I assisted him to a very small extent by furnishing data upon which to make his report, and I am familiar with it, and am familiar with the use made of the report in establishing the Irrigation District on a substantial basis with respect to its water supply, and in connection with the sale of bonds. Before his examination I had reached the conclusion as to the available water supply, and my conclusion agreed with his, that the amount available from the Laramie River

was a trifle in excess of 70,000 acre feet. By this I mean  
1851 that this would be the amount of water available from the Laramie River which could be diverted through the works proposed, and could be carried to the land. Unless such an amount were available for application on the lands themselves, the water supply would be insufficient. I wish to correct this statement, as I did not understand the question. I mean that 70,000 acre feet is available at the Laramie River, and that considering the system of exchanges and storage, I would think that about two-thirds of this amount would reach the land to be irrigated. Professor Carpenter's report and conclusions were based upon the project which

1852 was then in course of construction, and which has been constructed substantially along the lines then contemplated. We usually considered the amount available from the Laramie River at from 60,000 to 75,000 acre feet, 70,000 perhaps being a little bit more than the average for any long period of years, and that this was one-fourth of the flow of the stream at the state line.

1852 Since leaving this project in February, 1911, no data relative to stream flow has been brought to my attention which would change my opinion as to the relative amount of water diverted from the Laramie River through the tunnel. I am not familiar with the data collected by the office of the State Engineer of Colorado since 1909 or 1910 relative to the stream flow at the

1853 state line or Glendevy. My conclusion as to the duty of water in the Poudre Valley is based upon my personal acquaintance with the canal systems, the amount of water taken at the head of the canals, the records made by the ditch superintendents and water commissioners, and the general records of the ditch companies. It has been based upon information gathered ever since 1902 and 1903, and is in part upon the reports of the amount of water furnished by the various canals in the Poudre Valley during the past four years. I do not consider that the least amount furnished as shown by these reports as the duty of water in the Poudre Valley. My conclusions upon this matter are based largely upon the record of the Larimer County Canal, owned by the Water Supply and Storage Company, of which Mr. Edwards is the president, and which is conducted on perhaps the most conservative lines of any canal in the Poudre Valley.

I would estimate the capacity of the Laramie-Poudre tunnel, in the neighborhood of about 1,000 cubic feet per second. It was constructed with the purpose of taking the largest flow occurring in the

- river, as it would be no cheaper to construct a smaller tunnel.
- 1854 In the final operation of the system it may be possible to divert a certain amount of the winter run-off from the East Fork and West Fork, stored in the regulating basin at the head of the tunnel. Perhaps 75 to 85 per cent of the run-off of the Laramie River in Colorado comes between May first and November first, and it might reach 90 per cent. The flow from May to November in 1911 at the state line was, I believe, abnormally low, whereas the flow in 1912 was about normal, such being the conclusions reached in some investigations in which I was interested made for
- 1855 hydro-electric development of the Poudre. I believe that this condition was true of the Laramie watershed as well as of the Poudre watershed. I would consider that the report of the State Engineer of Colorado, of a flow of approximately 160,000 acre feet at the state line from April 12 to November 30, 1912, was small.

Redirect examination.

By Mr. Delph E. Carpenter:

- 1856 I did not intend to convey the idea that 100,000 acre feet storage capacity did not represent the limit of the irrigation possibilities of this system as to any one year. Referring to the map, Exhibit 1, I will explain that the waters obtained from the Laramie river watershed through the Cache la Poudre river, are taken through the Poudre Valley Ditch in such quantities as are perhaps required from the immediate needs of the system. It was intended to have a reservoir on the Poudre river in the bed and channel of the same, by which the floods or peaks of the floods of the Cache la Poudre river and also of the Laramie river, would be conserved and regulated. Delivering that water from this reservoir to the Poudre Valley Ditch to the extent the same would be able to carry it, it would be possible to regulate the amount of water required for the area to the greatest possible extent. If climatic conditions demanded a very large amount of water for a short time, the McGrew Reservoir could furnish a large portion of that from waters previously stored in there. The largest body of land is situated under that reservoir. Capacity of inlet canal was designed and considered to be the minimum for the reason that the loss should be reduced to the minimum. Its carrying capacity would at all times be practically its maximum. The water would be kept
- 1857 running at about the maximum capacity of the canal. Delivery of water to a large portion of the land tributary to the McGrew Reservoir could be accomplished by having a large distribution system at that point. Two laterals of large size were designed and practically built for that purpose.

McGrew reservoir has a double function, that of regulating the flow and that of a storage basin. Water used in irrigation of lands embraced in District, particularly on lands in upper portion of district above central lateral, would in few years develop return waters in natural draws and drainage channels of that area. It was designed and contemplated from the outset to develop and use those

return waters, and this led to the construction of reservoir capacity under the central portion of that area to conserve and catch and hold the waters of return character that would flow throughout the entire year. March and Camfield reservoirs were designed and built for that purpose. They are also to be used for the purpose of storing waters from the rivers and as regulating basins. They have the same possible use as the McGrew Reservoir because there are lands below this reservoir and lateral extension covering those lands. If water were running down the channel to McGrew Reservoir at any given time, greater than the then immediate demands, this surplus water would undoubtedly be stored in McGrew Reservoir temporarily and until such time as it would be required for the lands.

1858 This reservoir would rise and fall with the demands of land owners for water. I might add that perhaps the practical operation of that system will make it necessary to keep the water as high as possible at all times. The upper reservoirs are the ones that will be filled the most; as much as possible in the bed and channel of the Cache la Poudre river, those upon the Laramie river, and then the McGrew Reservoir and the lower reservoir will be reserved until capacity of Upper reservoir is exhausted. It is advantageous to have water above lands as high as possible in order to bring the best service.

Greatest fluctuation in the water would be occasioned by amount of water coming in and demands of system below. Irrigators prefer to apply water directly from ditches. The canals will be kept operating as the necessity demands. The reservoirs will serve as regulators to facilitate the delivery through ditches. This function of regulation is in addition to the usual function of storage. Storage

1859 may be considered the filling of a reservoir of fixed capacity and drawing it out according to the demands of the lands served, without refilling during that season. Usually refers to storage of waters in one season of the year for use in another, while in regulation the reservoirs would not only be used for storage, but also for holding back the water for limited periods of time for distribution according to the crop demands, while the inlet to the reservoir would supply it at a uniform rate, depending upon supply. Supply and demand, speaking in a broad way, would determine the amount of water carried over from one year to another in the reservoirs of this system. If the supply of any one year would exceed the demand, there would be some remaining for the next year. The water supply fluctuates from season to season. The demand is not as variable as the supply. There are seasons when the demand is a little greater than others, or a little less than the average, but the variation is small. Supply often varies as much as 300 per cent. That is, by using the low and the high year as a basis of calculation. I used the low year as a basis. Probably 50% below and 50% above normal would be a better way to put it.

In describing the work performed on Laramie River portion of Greeley-Poudre system, I did not include the amount of work done on the reservoir, commonly known as the Tunnel Reservoir. About

\$20,000 was expended there. Particular function of that reservoir is for the regulation of the flow of water into the flow of the tunnel. All water received from collection ditches and tributaries of the stream will naturally discharge into tunnel reservoir and from there can be regulated through the tunnel into the Cache la Poudre river.

It was constructed on a smaller scale than originally surveyed. The diminution of the reservoir would, if anything, increase the flow of water in the river below. Without the reservoir, the diversion capacity of the system would be very little different.

The original plans contemplated an East Fork Reservoir. The plans relating to that have been abandoned and the Tunnel Reservoir substituted. The site of the East Fork Reservoir was more of a natural reservoir site than that of the tunnel reservoir. The first consideration involved the cheapest site, but the delivery of waters from the Upper Rawah into that reservoir so as to be regulated through the tunnel caused the substitution of the Tunnel Reservoir.

If I stated in cross-examination that the last work done on the Upper Rawah Ditch was in 1907, I undoubtedly had in mind the larger construction, as I had previously testified that there was work done there in 1909 and 1910. We always went up there to repair that ditch, keep it in shape and run such water as was tributary to the stream through that Ditch each season. The Hardy Brothers worked there the years 1908, 1909 and part of 1910. I would not presume to say that work had not been done there in 1912 and

1862 1913. I have not had charge of the work during those years. The costs of construction which I gave to counsel for the plaintiff did not include on any unit the overhead expense, such as office expenses, administration and engineering. The figures represented total amount paid to contractors for that portion of the work done by contract. It did not include any money expense of clearing right of way, which is a separate account and was not included in that. It was more general and could not be separated into each unit. The figure of \$47,000 which I gave to counsel for plaintiff as cost of Upper Rawah Ditch, did not include engineering and overhead expense. That merely included the actual excavation work.

1863 In 1906 there was a ten-year term agreement entered into between Mr. Hibbard and others, with the Water Supply & Storage Company for use of the Sky Line Ditch temporarily during the construction of the tunnel. A reciprocal arrangement between the parties for diverting through the tunnel at other times. So that the water of the Sky Line Ditch, belonging to the Water Supply & Storage Company might be diverted through the tunnel after its completion. That was the arrangement in the contract of 1906. It is undoubtedly the instrument dated September 26, 1906, and recorded in Book 250 at page 125 of the records of the County Clerk and Recorder of Laramie County, Colorado.

I consider that the lien existing for some work on the tunnel will be paid, at any rate, the work has been done.

Referring to maps examined by me designating various ditch and

tunnel locations which maps were marked plaintiff's Exhibits O to T, inclusive, I will state with particular reference to the tunnel that it is upon the line surveyed by Mr. Duvall. There is but a slight difference in the general location between the Duvall Survey 1864 Line and the Tenney Survey proceeding. Tenney's survey was of more of a preliminary nature, and at time of year when detailed consideration was not possible. An advantageous location from which to start was selected and a traverse line run across the divide without detailed examination. This survey was made in March. Considerable snow was on the ground and the survey was of a preliminary nature and was followed by a more definite survey by Mr. Duvall, at which time more consideration was given to the exact portal location.

We followed the Duvall line with our construction the only difference being in respect to the grade and elevation. The Duvall tunnel contemplated water to be taken from the West and East Fork of the Laramie, by means of a ditch and bring it around to the toe of the hill to the steeper and more solid portion of the mountain side. Upon detailed examination and with full consideration of all the collection and regulation problems, it was decided to lower the entrance end of the tunnel and I believe it was made 40 feet lower, so as to require an approach cut and to be able to take the water from the bed and channel of the Laramie river. The present tunnel is directly under the Duvall line. The Duvall line had a slightly different grade than that which was finally adopted and a different entrance elevation, so it is, on the whole, just about below the Duvall line.

The change was entirely one of construction consideration, and it neither increased nor decreased the demands from the river in the smallest degree.

An enterprise of this nature could not possibly be constructed without preliminary investigation, without detailed examination and final computation along all possible lines to get feasible results. I think Mr. Duvall made other surveys of tunnel lines than the one finally selected by him.

A tunnel line is designated on a map filed by me or under my direction, with west portal about a mile or a mile and a half further down stream. The east portal of that tunnel was at about the same location as the east portal of the present tunnel. If the tunnel had been constructed on this lower line there would have been but a very slight extra demand for water from the stream. It might have been possible to lower the collection ditches on each side of the valley to some extent which would increase the watershed slightly. It would have been very small, due to steep hillsides upon which these ditches are located. A distance of 100 feet would make a very small area as far as run-off is concerned. Even if such a tunnel had been constructed it would have accomplished the same end.

1866 It is a fact that the construction of the tunnel was the culmination of efforts beginning with Link and Akin and early designated by Tenney and Duvall surveys. There is no substantial departure from the original idea. The other surveys,

such as the Boulder Ridge Ditch and others, were the necessary investigations to satisfy the parties owning interests in the Company and the new parties that came in from time to time, contending for more investigation and further analysis of the entire system, and as each part was done it was filed upon and rights protected as much as possible. They represent in record form the various sidelights upon the enterprise.

At no time was the tunnel plan abandoned. We never had an investigation that suggested the possible abandonment of the tunnel. It was so apparent almost on its face, owing to the natural conditions, that it was very hard to figure out any means whereby the tunnel would be improved on.

The two lower collection ditches as now constructed have no apparent different effect upon the stream than would the collection ditches determined by Mr. Duvall in 1904. He planned to drain with his system the same watershed now drained by the system as partly constructed. I simply substituted tunnels through solid rock which he avoided by siphons.

1867 When I have been speaking of the Duvall map, I refer to plaintiff's Exhibit P, being map of 1904, No. 1722.

I commenced work on the Laramie river Reservoir in the fall of 1906. The date given on the map is 1908. That indicates the time that the final and definite survey was made on the reservoir site, and the investigation of its possible use in connection with the system. The Boulder Ridge and Sand Creek Ditch was the outlet of the reservoir. The construction of that reservoir as a part of the inter-watershed diversion was abandoned along with the abandonment of the idea of the Sand Creek Ditch.

There was some extortion practiced in connection with the conflicting filings. It is a fact that engineers and others may file any number of maps they wish in this state on the same project.

1868 Many conflicting filings may be made by divers parties upon the same general project. The Sand Creek Ditch and Laramie River Reservoir inter-watershed system would have diverted some little more water than does the present system. That system would also have obtained the waters from the portion of the watershed lying between the two collection ditches, some portion of the waters from McIntyre Creek and all water that escaped and flows over the collection ditches as now constructed. It would also have intercepted the water in the streams crossed by it in its course.

1869 There was an investigation made for an extension of the lower collection ditch from Rawah Creek to McIntyre Creek. Such a line is not practical at the present time. It would have intercepted the waters of McIntyre Creek at a point above the crossing of the State road with McIntyre Creek. The State road runs due west from Glendevey. It is within the range of possibility that at some time a diversion may be made by an extension of the lower collection ditch around to McIntyre. I intended that possibility to be included in my statement of the final development of the system.

Referring to losses of water in the Poudre Valley Canal, there are several sections of the canal in which the losses are very heavy.



These sections have been built along a steep hillside in material that was of a porous and shaley character that permitted a large percolation of water. These are the same sections that the District contemplates lining with concrete. The loss in the canal will in a large measure be eliminated by the contemplated concrete lining. The future diversion will not be subject to the same criticism as has past diversions. Continuous operation of the system will reduce the loss each year and the losses will always become less.

1870 I made investigations with water officials to determine the loss in evaporation and seepage in the quantities of water conveyed in the Cache la Poudre river from Chambers Lake to the headgate of the canal of the Water Supply & Storage Company. The actual loss was never really determined. It resulted in showing a very small loss, much smaller than was first anticipated, so that the arbitrary amount of 5% was decided upon by both parties in interest as being equitable. That was rather in excess of the actual loss. The distance between the Greeley-Poudre tunnel and the head of the Poudre Valley Canal is less than from Chambers Lake to the head of the Larimer County Ditch, and the loss should accordingly be less.

When I stated that the greater portion of the expense of securing water was on the Laramie river portion, I did not have in mind the channel reservoir on the Poudre. The greater expense is in fact on the Poudre river side. That reservoir is to be used along with the rest of the Poudre units jointly for both the waters of the Poudre and the Laramie. Such a reservoir is imperative for the maximum but not the minimum use of the waters of the Poudre. It was necessary to obtain such maximum use in order to warrant the construction of so large an enterprise. The water obtainable

1871 from the Cache la Poudre watershed is such that at times it comes in very large quantities. In order to make this water available by means of reservoirs away from the channel of the river, it would require an inlet ditch, the cost of which would be prohibitive for the amount of water obtained, if the site should be at any distance from the river. A reservoir in the bed and channel will catch and hold and receive all the waters in whatever quantities it may come, and at every season of the year. The channel reservoir will be of material help in storing water during times of extreme cold months and waters obtained from Laramie river during winter season. It is impracticable to run water into reservoirs remote from the river at that time. \$42,300 was expended in engineering on the system from 1905 to 1911. All of that was essential. This amount is considerably less than usually expended on a system of equal magnitude.

1872 Recross-examination by Mr. N. E. Corthell:

The water which was run through the Upper Rawah Ditch in 1909 and 1910 was water which was tributary to the ditch, and which before regulation works were put in it was necessary to run through the ditch and discharge out the lower end at the West Fork

of the Laramie River. The water went down the stream and no use was made of it. The determination to lower the tunnel about forty feet from Mr. Duvall's survey was reached after the final plans were filed in January, 1909, and before work was commenced on the tunnel. The possible future extension of the West Side Collection Ditch from McIntyre Creek would add a drainage area of perhaps thirty square miles.

Redirect examination.

By Mr. Delph E. Carpenter:

1873 The various dates noted on the various maps as the dates of commencement and indicated on Exhibits O to T, inclusive, indicate the dates of actual commencement on that portion of the works. In each case the date was noted on which we started surveying each portion. These dates do not indicate the date on which the first survey was begun on the system. All surveys were done upon the same general system. My present knowledge of this system extends to surveys made by myself or under my direction.

(End of Transcript, Vol. 4, defendants.)

1874 ZAC T. DUVALL, a witness in behalf of defendants.

Direct examination by Mr. Delph E. Carpenter:

Zac T. Duvall, civil engineer. Engaged in practice of profession 35 years. Age 60. Have been associated with construction of ditches for irrigation and practical application of water to land for 35 years. Have lived in Colorado for past 47 years. Resided on my father's farm 15 miles south of Denver from 1869 to 1875. Made a study of ditch construction and application of water on my father's farm and on farms in vicinity. During these years I surveyed ditch. From 1876 to 1881 was at Deadwood, S. D. While there was U. S. Mineral Surveyor. Did engineering on two placer mining ditches, the Spearfish Ditch and on the Black Hill Placer Mining Company's flume. Flume was 18 miles long. It was located, designed and constructed under my supervision as assistant engineer. These ditches involved diversion of water for placer mining purposes.

Spearfish Ditch was an inter-watershed diversion from Spearfish into Whitewood and Deadwood watershed at Lake and Central City. The other was in the same valley, out of Spring Creek.

In 1881 was on Union Pacific Railroad. In 1882 and 1883 was at Silverton, Colorado, in the San Juan Country on mining surveys. That involved construction of ditches for power. I surveyed some of these canals. Was deputy U. S. Mineral Surveyor for Colorado during those years. From 1883 to 1885 was engineer on the North Poudre Canal, taking water from the North Fork of the Cache la Poudre river, and in employ of The North Poudre Irrigation Company. Work was located northwest of Ft. Collins, Colorado. My services in connection with that system consisted in the completion of

the mountain division and plains division of the system. We put the water through it and started construction on Reservoirs Nos. 1, 3, 5 and 6. First mile of this canal is constructed in mountains and remaining seven miles of canal are on more level plains, not so rough as first mile. Construction involved three tunnels.

Referring to defendants' Exhibit No. 1, the North Poudre canal commences in Section 13, Tp. 10 N., R. 71 W. It runs southeast. It is located below the reservoir noted on the map as Halligan Reservoir.

In 1886 was on the Denver and Rio Grande Railroad, engaged in civil engineering. In 1887 was on Dolores No. 2 Canal in Montezuma County, in the western part of Colorado, engaged as engineer. This canal diverted its water supply from the Dolores river. Waters thus diverted were applied to beneficial use on the head of McElmo

River. I was Chief Engineer for the enterprise, and Mr. 1877 E. S. Nettleton was Consulting Engineer. From 1889 to

1891 was on the Amity Canal and the Colorado and Kansas Canal. These are on the Arkansas River. The Amity Canal is on the north side of the river, opposite Lamar, and the Colorado-Kansas Canal is on the south side of the river. My duties were the same on these canals as on the Dolores No. 2 Canal. Mr. Nettleton was also consulting engineer. I was Chief Engineer. Completed the Amity Canal to a distance of about 61 miles. That is now one of the largest canals in the Arkansas Valley. It has been enlarged since I was there. We constructed about 12 miles of the upper end of the Colorado-Kansas Canal. It was an old canal and we enlarged it from about 12 feet to 30 feet on the bottom.

In 1899 and 1900 was Assistant Engineer on the Board of Public Works in City of Denver.

In 1904 I made surveys of Link Lake Ditch. In 1905 was engineer on Mountain Supply Ditch Company, constructing small reservoirs in the valley in the spring of the year, and in the summer was engaged on Cameron Pass Reservoir and Peterson Lake Reservoir. In fall went back to the valley and worked on small ditches and reservoirs for the company. I refer to the Cache la Poudre Valley. The valley work was near Fort Collins.

1878 The Mountain Supply Ditch Company's system involves inter-watershed diversion, over Cameron Pass from Michigan Creek, a tributary of the North Platte in North Park. These reservoirs I have named are about five miles north of Cameron Pass on the Joe Wright Creek, where the Cameron Pass Reservoir is located. Chambers Lake is at the head of the Cache la Poudre River. Three streams, Joe Wright Creek, Trap Creek and Fall Creek discharge their waters into this lake. The Mountain Supply Ditch system involves the bringing of water from the North Platte drainage area in North Park over and into the Cache la Poudre drainage for application on lands north of Fort Collins, Colorado.

In 1905 was again engaged in engineering on Cameron Pass and Peterson Lake Reservoirs. In 1906 was on Mitchell Lakes for a short time and was later in Garden City, Kansas, on the U. S. Sugar

& Land Company enterprise. Was building No. 5 reservoir and enlarging the inlet ditch from the Arkansas River. This reservoir covers 3,080 acres at high water line and the ditch was enlarged from 20 feet wide to 40 feet wide a distance of 12 miles. About \$300,000 was expended under my supervision as engineer.

In 1909 was south of Sheridan, Wyoming, on the Big Horn Reservoir for the Reed Investment Company. The enterprise was rather small. At high water line it only covered 134.7 acres, and held about 1,620 acre feet.

During summers of 1910, 1911, 1912 and 1913, was engaged on Chambers Lake, Lost Lake and Laramie Lake for the Water Supply & Storage Company. That is the same Chambers Lake I have heretofore designated as being at the head of the Cache la Poudre river. That work involved a reconstruction of Chambers Lake and Lost Lake. They are mountain reservoirs. This work was done under my engineering supervision. Chambers Lake had previously broken twice. Lost Lake is about half a mile north of Chambers Lake. It is right on the divide between the Cache la Poudre and Laramie river drainage. I constructed a dam at each end of the lake. Lost Lake originally discharged its waters into the Laramie river. It now discharges into Chambers Lake and the Cache la Poudre river.

Laramie Lake is about three-quarters of a mile north of Lost Lake on the Laramie River drainage. It naturally discharges its waters into the Laramie River. It now discharges into Lost Lake and thence into the Cache la Poudre.

The Sky Line Ditch conveys water from the West Fork of the Laramie River over the divide into Chambers Lake. This same company also has a small ditch on Cameron Pass, bringing waters over from the Michigan river, which is located in North Park. This water is brought over the divide into the Cache la Poudre. They also have what they call their Grand River Ditch, about 7½ miles long, constructed at an elevation of about 10,000 feet and diverting waters from the headwaters of the Grand River, which, if not thus

diverted, would naturally flow into the Pacific Ocean. They are diverted and carried by this canal over into the head of the Big South Fork of the Cache la Poudre and thence down to the Water Supply & Storage Company's ditch at Fort Collins.

This Company irrigates lands immediately adjacent to those of the Greeley-Poudre Irrigation District. The Ditch is commonly known as the Laramer County Ditch. Waters derived from these five inter-watershed diversions which I have mentioned constitute a part of the supply for the irrigation of the land under the Water Supply & Storage Company's Laramer County Ditch. This canal also depends in part upon the Cache la Poudre River for its water supply. It is necessary for the Laramer County Canal to have the combined supply obtained from both the Poudre and the inter-watershed diversions in order to irrigate the lands served by it. This Company also has a reservoir system, of which the three reservoirs which I have mentioned are a part. In Chambers Lake, the water from the Poudre, the Laramie and the Michigan rivers are commingled and

stored. This natural lake is utilized by this company as a storage and collection reservoir.

My first acquaintance with the Greeley-Poudre system was in 1904 when I was engaged as engineer for the permanent location of a tunnel. Also had charge of engineering on Upper Rawah Ditch. This was permanent location. I ran preliminary lines for the East Side Collection Ditch and the West Side Collection Ditch. R. Q. Tenney, of Fort Collins, Colorado, preceded me in laying out the preliminary lines for the tunnel. Mr. Beach had preceded me in the preliminary surveys of the Upper Rawah Ditch.

May 22nd, 1904, I went to the Laramie River to engage in this work. Myron Akin, of Fort Collins, employed me in behalf of his associates and himself. I was under the immediate direction of Wallis A. Link, while engaged on the work. I began work on the Laramie River Tunnel of the Greeley-Poudre System May 23, 1904. I found evidences of preliminary survey which had been made by R. Q. Tenney. I did not vary to any considerable degree from that preliminary line. I located the west end of the tunnel about 200 feet north from where his stake was, for the reason that where his stake was situated there was a great deal of drift from a gulch which had washed down and I moved over to get under a ledge of rock so that the entrance of the tunnel might be near to the surface and in the solid rock. The change avoided timbering in the loose material at the west end of the tunnel. The east end of the tunnel I located at the same place as had Mr. Tenney.

I had five or six men in my party and was engaged in the engineering works in the Laramie River Valley for Akin, Link and associates from May 22 to October 10, 1904. About two weeks were consumed in making the tunnel survey. I ran two lines of tunnel at that time. The one which I commenced about 200 feet north of the west end as located by Tenney was the one I finally selected. The other line I ran was about 80 feet south of the one I finally selected. The one about 80 feet south was a little longer than the permanent tunnel selected. It came out at the same place on the east side that the Tenney and permanent lines came out. All three surveys terminated at the same point on the east side.

1884 I also located the inlet ditch for the tunnel from West Fork of the Laramie River across the East Fork and into the tunnel.

Plaintiff's Exhibit P represents the survey that I made during the season that I was there. It indicates nothing else than the surveys made by me. The tunnel line located on the map is the one finally selected by me. The inlet ditch of which I spoke is noted on this map. It commences at point on West Fork of the Laramie River, from which the N. W. corner of Sec. 7, Tp. 8 N., R. 75 W. bears north 7 degrees, 19 minutes west, 3863.7 feet. From that point it is run easterly across the East Fork of the Laramie River to west entrance of the tunnel. This ditch was constructed to carry waters from the West Fork to the East Fork and to the tunnel. The waters of the Upper Rawah Ditch are discharged into the West Fork and

thence down that stream and into this inlet ditch and then into the tunnel.

1885 I have been on the ground since the tunnel constructed by the Greeley-Poudre Irrigation District and the Laramie-Poudre Reservoirs and Irrigation Company was completed. The line of tunnel thus completed is the same as the line of tunnel indicated on the map, plaintiff's Exhibit P. In addition to locating the inlet ditch from the West Fork to the West Portal of the tunnel, I constructed about 500 or 600 feet of the canal from the creek and turned water in from the West Fork of the Laramie river June 10, 1904.

That was the first actual excavation work on any part of the Laramie river system. Water ran through that portion of the inlet ditch which we constructed from the West Fork. After constructing this portion of the ditch, I went to the outlet end of the Upper Rawah Ditch and commenced permanent location of that canal to Rapid Creek, so that right of way could be cleared for excavation, and afterwards continued survey through to Rawah and McIntyre Creek. The line thus permanently located by me was practically the same from the outlet end of the ditch to Rapid Creek as the line located by Beach. From there to McIntyre Creek I selected a line a little lower down than the Beach line to avoid expensive construction south of Camp Lake. It had no effect one way or the other on the

1886 water supply. So far as diversion of water is concerned, the line I selected was practically the same as that laid out by Beach.

We were able to get up to lower end of this Upper Rawah Ditch to start our surveys July 4, 1904. We could not get up there earlier on account of snow at head of Fall Creek and Rapid Creek. Snow was too deep. We could not do anything.

Crews of men had been working on the Laramie River system before I went there in 1904. A road was made from the mouth of the West Fork up to the Sky Line Ditch, our first camp. That road was necessary as all our supplies came in that way. Construction of highways in such regions is a necessary prerequisite to excavation work upon ditches. Road construction in such cases compares with the necessity of road construction in mining enterprises. When I arrived on the Laramie river, in May, 1904, the road had been constructed up to the Sky Line Ditch. Between June 10th and July 4th, 1904, I commenced work on the lower collection ditches. I commenced on East Side Ditch at the tunnel and located the line north for about 3,000 feet to the first pipe line across the Laramie River Valley. This pipe-line is noted on the map, plaintiff's Exhibit P, as the Fall Creek Line. At the west end of this pipe line and on the West Side of the valley I located two ditches, one from the Springer Creek south to Rapid Creek, and one below Rapid Creek and Fall Creek to the end of the pipe line. I had previously located the pipe-line of Fall Creek, making that system complete over to the East Side Ditch.

My idea in proposing to use a pipe-line from the West Side Ditch to the East Side Ditch was to avoid expensive construction on the



west side below those two small stretches of ditches. It would have required tunnels, rock work, etc.

1888 Prior to July 4 we had also constructed a road from the camp at the head of Sky Line Ditch to the lower end of the Upper Rawah Ditch. On that road we raised 1000 feet in elevation in about a mile and a half. We also constructed log house at head of Sky Line Ditch and Camp No. 1. When I first went into the valley on May 22, 1904, I located a weir for the purpose of measuring waters that came down from this Upper Rawah Ditch, near the head of Sky Line Ditch. It was so situated that water could be diverted either into the West Fork or the Sky Line Ditch. The weir was not constructed.

Was engaged with my engineering party in engineering work on Upper Rawah Ditch during summer of 1904, from July 4th to August. Immediately after engineering Wallis A. Link proceeded to clear right of way and blow out the stumps. He had a 1889 force of men and teams. We afterwards let a contract to Walthall & Ianson to commence excavation. They commenced excavation near outlet end of Upper Rawah Ditch, at point where the waters discharge down into the West Fork from the top of the hill. They had contract for excavation of 9700 feet of work. Work was divided into two classifications, earthwork and solid rock. There was no loose rock classification. All rocks measuring a cubic yard and all rock in place were rated as solid rock. Remaining portion of work was estimated as earth work. Mr. Link continued clearing right of way and as he cleared, I re-located line and put in slope stakes, or cross-section stakes. Mr. Link worked the rest of the summer clearing right of way with his force of men and teams. Snow on October 10th stopped him, although he remained a short time afterwards. I left October 10. I finished my engineering work on this ditch August 5th. I ran the permanent location about 7½ miles to McIntyre Creek. At that place the McIntyre

1890 Creek was just a little brook at that time of the year. There is no large channel there. It is about five or six feet wide and probably a foot deep. Plaintiff's Exhibit P represents line of ditch thus permanently located by me in 1904. In locating Link Lakes I used Mr. Beach's surveys.

I completed engineering work done by me on two lower collection ditches October 1, 1904. I worked on those ditches during August and September after leaving Upper Rawah Ditch and completed both surveys, one on east side and one on west side of Laramie River. Those completed lines are indicated on the map. One is called East Side Ditch, Deadman & Nunn Creek Ditch. The first part of the West Side Ditch we called the Rawah Pipe Ditch and the other one we called the Fall Creek Pipe Line. These 1891 two last named ditches together constitute what is now called the Lower Rawah, or West Side Collection Ditch.

Mr. Hedke can give more exact location of these two ditches as now constructed than can I. Plaintiff's Exhibit P represents work done in the year 1904. I did not assume to represent any other work done by any other engineer prior to that time.

The sentence appearing in statement of claim on Plaintiff's Exhibit P "and work was commenced on additional ditches and pipelines going to make up this entire claim August 6, 1904," is the date of completion of surveys. I commenced the work actually on May 22, 1904. I don't know how that date occurs in the statement. The dates that I have previously given are the correct dates. I have refreshed my memory by consulting a diary kept during the work.

1892 Estimated carrying capacity of tunnel I located and designed was 1000 cubic feet per second. I had full engineering party with me during all this work in my department throughout the year 1904. I had the assistance of engineer R. Q. Tenney for a short time and Mr. Norvell was instrument man and assisted me in mapping. Activities in construction of ditch line were going on during all time I was there. Both surveying and actual excavation. The first work was clearing right of way before we commenced final location.

A road had been constructed into this work on the Upper Rawah Ditch prior to 1904. It came up from State road near head of this location and was continued over to Camp Lake. In 1904 a road was constructed up West Fork and along line of Upper Rawah Ditch to Rapid Creek and then over Grassy Pass to Camp Lake, so that the two roads joined. These two roads were necessary before construction could begin on this system. They were necessary prior to permanent survey work done by me, although connections of the two were not made until later. In making my survey I had to use pack animals to complete the upper line. I made use of the roads up to the ditch line. These roads were of value in

1893 connection with this enterprise, both for construction and engineering. Prior to construction of these roads supplies could be brought to this line only by pack animals from the Sky Line Ditch. That is not a practical method of transporting machinery, supplies and men. During summer of 1904 we built log house near head of Sky Line Ditch and one on Rapid Creek near where ditch line crosses the stream. Headquarters for work done on Laramie River that year was at Lanning's Place. Our supplies were brought in by teams to Lanning's place and other teams would take them over and bring them up onto the line of work. That was a freight station. An employee was kept in charge of that station during part of summer. Lanning's cabin is in N. E. quarter of Tp. 8 N. R. 76 W., about 2 miles northwest and down stream from mouth of West Fork. It is on floor of Laramie Valley.

In addition to running the ditch lines I traced the correction line from the township corner to find the corners along the lines of the Upper Rawah Ditch and also retraced the township line along the Deadman and Nunn Creek location. This involved considerable time and labor for the reason that in many places corners were not in. Corners were found in a rough, rugged country in many places, in dead timber and timber.

We had light snow storms pretty nearly all summer of 1904. They were of short duration. We had a great deal of rain. Snow

drifts were lying on the ground on the line of the Upper Ditch up to August 5th. This canal is located in the regions where the snow falls the year round.

1895 By barometric computation the lower end of the Upper Rawah Ditch is 1,700 feet higher than the west portal of the tunnel. The point of diversion of the Upper Rawah Ditch on McIntyre Creek is in the neighborhood of 1800 feet higher than west portal of tunnel.

I have had considerable experience with mountain construction over a long period of years. This class of construction requires much more time than it would if located on the plains and it is much more expensive. The comparison is quite startling. It is illustrated by prices we have to pay in that class of work. We paid 35 cents

a cubic yard for earth work there that would cost 12 or 14 cents in the valley. To illustrate the time consumed, I was

1896 three seasons building Chambers Lake Reservoir in which 53,000 cubic yards of material were used and could have done the same work in the valley in probably three months. This Chambers Lake is much more accessible than the Laramie River System. There are good roads from Fort Collins to Chambers Lake and more conveniences in every way, such as telephone connections, plenty of material, etc. Elevation of Chambers Lake is 9,100 feet according to barometric observation. Cost of construction increases with in-

crease of elevation in this mountain work. The working seasons shorten as the elevation increases. On plains regions we

can work pretty nearly the year around in ordinary seasons. On Upper Rawah Ditch we could only work from July 1 to October 10th, that year, 1904. Even during that time work was not as convenient or easy of accomplishment as similar work involving similar materials would have been on plains region, because of elevation, expense of getting material in and climatic conditions. It was very wet. Rain stopped the work. It is very difficult to keep men early in the fall on work of that kind situated as high as it is. Even during summer months it is not as easy to keep them, as it is on other work.

Organization of a working force on mountain work, followed by necessary abandonment and necessary re-organization the next seasons interposes an obstacle to rapid construction. In fall snows come, and men are anxious to get away for their season's work in the winter on the plains. It is almost impossible to retain men in late months. For illustration, we had all of the Ianson teams in his stables from the 1st of October until October 10th, on account of not having drivers. He could not keep them and he quit on the 10th and went out. There was no strike. That is a common experience on that class of work. We had the same experience on the Sky Line Ditch and also on the Grand River Ditch. This class of labor requires more skilled men than does plains work, on account of using powder, rock work, etc. It is higher priced labor. Early winters on these high regions usually brings about a spirit of discontent.

In 1905 I made a survey of another tunnel to the north of the

present Greeley-Poudre Tunnel, that is the west entrance of another tunnel to the north of the present one. It came out at the same place as the present tunnel on the Poudre side. This tunnel is located on plaintiff's Exhibit P. I ran the line from near the point marked "Mill" on Exhibit P. This line was some 2,000 or 3,000 feet longer than the one located. I never did anything further than merely locate this line. I reported it to my employers and put it on the map that they have in their office. That line was contemplated by me in 1904. I did not run it that season because I did not have sufficient time. It was completion of work started in 1904. In 1904 and 1905 I ran three tunnel lines; one indicated by tunnel line appearing on plaintiff's Exhibit P; one coming out of Laramie river a little south of west portal of that tunnel and discharging into the Poudre at the same point, and one coming out of the Laramie river about a mile and a half north of the west portal of the first tunnel named and also discharging waters into the Poudre river at the same point. The one found on plaintiff's Exhibit P was selected. It is the one on which the present tunnel is located.

Cross-examination by Mr. N. E. Corthell:

1900 According to the map designated "Exhibit 1," the Laramie County Ditch system with its extensions, extends into the Greeley-Poudre Irrigation District and is so situated that it would water a considerable part of the land within the District. I have never been in that region so do not know whether lands within the boundaries of the District are watered from that system. According to this map, the ditches marked "Pierce Lateral" and "Central Lateral" are extensions of the Laramie County Ditch.

The west end of the tunnel has been somewhat lowered from the survey I made, but I do not know how much. As now constructed, it is designed to take water from the level of the stream opposite the upper end, whereas my survey required an intake ditch to get the water into the tunnel, some of this ditch being built the year I was there. Water was run through it, but no use whatever was made of it. I do not think it was completed, and I do not know whether it is now a part of the present system. I do not know that any work was done on it since 1904.

1901 The upper Rawah Ditch which I located was designed to gather water in the higher elevations northwest of the west Fork, and we could carry it either through the Sky Line Ditch into Chambers Lake or down the West Fork into the tunnel. I was engaged in the survey of that ditch from July 4 to August 5, 1904, and the construction work commenced, according to my diary, on August 9th. The work commenced on August 6th with the clearing of right of way and blowing stumps out. On July 28, 1904,

1902 Mr. Link did a small amount of rock work at the outlet end of the ditch, and on August 6th had charge of the work of excavating on the north side of Rapid Creek. When I was last in

the Laramie Valley no connection had yet been made between the Rawah Ditch and the Sky Line Ditch.

1903 When we finished the work in 1904 we had a road along the line of the Upper Rawah Ditch clear to the head of the ditch at McIntyre Creek. Work was done to station 67 from the lower end of the ditch about 6,700 feet, although it was not all completed over this portion. The contractor was given credit in two estimates for 8,358 yards of excavation. The men employed by the contractors were largely laboring men from Fort Collins, who seemed to want to work in the sugar factory during the winter and quit work in the mountains when it commenced to snow.

1904 We used as headquarters a ranch about two miles below the tunnel, from which point there was an open traveled road down the Laramie River to the Railroad at Laramie City, and also a road passing over the hill to Chambers Lake.

The work in the vicinity of Chambers Lake which I have testified about, consisted in rebuilding the dam to the height of 46 feet, requiring 53,000 cubic yards of earth; building concrete culverts, rebuilding Lost Lake, and improving the outlet at Laramie Lake. Up to the fall of 1912 we spent \$44,700 on Chambers Lake, and the cost of the open cut into the lake I do not know.

1905 Work cannot be carried on economically after October in the upper part of the Laramie Valley where the tunnel and collection ditches are located. Sometimes, if the winter is not very severe, some work is done after the first of October. I do not know where the Laramie, Hahns Peak and Pacific Railroad passes the same range of mountains, nor whether work on that road was carried on continuously during the winters of 1907-08, 1908-09, and 1909-10. Tunnel work, which is not exposed to the weather, could probably be performed during the winter. I do not know whether work was performed on the tunnels of the West Side Ditch during the winters or not.

My knowledge of water conditions in the upper Laramie Valley is confined to observations made in 1904. I have not been over these works since they were constructed. I do not know how they conform to the plans I laid out, with the exception of the tunnel. I have not been over the Upper Rawah work since I left there in 1904, and know nothing of that work since that time.

Redirect examination by Mr. Delph E. Carpenter:

1906 I was over on Mountain Supply System in 1903. I then heard of an enterprise on the Laramie river under Mr. Akin and Mr. Link in that year. That was the year previous to the time I made my surveys.

### *Stipulation.*

It is stipulated that the estimate given by Mr. Duvall to Ianson & Walthall for work done during 1904 is an estimate on the same work checked over and re-checked by Mr. Hedke in 1905.

(Defendants' Exhibit 51 offered in evidence, being exact copy of Plaintiff's Exhibit P heretofore referred to in testimony of Zac T. Duvall and Charles R. Hedke, the same being a copy of the map of the Laramie tunnel, ditches and feeders, as prepared by said Zac T. Duvall and as covered by his testimony heretofore offered.)

WALLACE A. LINK, Fort Collins, Colo.:

Direct examination by Mr. Charles F. Tew:

- 1907 Live at Fort Collins, Colorado. There for 12 years. Lived previously on Laramie river in Colorado at point of present reservoir site of Laramie River Reservoir. It is sometimes called Big Park. My house was three-fourths of mile up stream from Glendevy in Sec. 35. It was near dam site of this reservoir. Lived there between 8 and 9 years. Engaged in cattle business. Prior to that time was located on Stuck Creek, Colorado. That stream is a tributary of the Laramie river on west side. Lived about  $3\frac{1}{2}$  miles up creek from mouth. Mouth of stream is about  $\frac{3}{4}$  mile south from north line of Colorado. Lived there two years and was in cattle business. Previously resided in Black Hills about 12 miles east of Laramie, Wyoming, on head of Horse Creek and ran cattle there. Lived there nearly four years. Horse Creek flows eastward and rises in Black Hills on east side of Laramie Plains.

Was raised at City Springs, east of Laramie, about  $2\frac{1}{2}$  miles. Came there when nine years old. Parents located there in June, 1871. I made my home there from 1871 to time I went to Horse Creek. Was absent from 1877 until fall of 1880. Attended school in Laramie. Spent my youth in Laramie. Previous to

- 1909 going to Horse Creek took care of our own cattle and worked for different cattle companies. Worked for Diamond Cattle Company; March and Cooper on Rock Creek; also Balch and Bacon on Riverside Ranch. Worked for Bar Circle outfit at Iron Mountain.

The Laramie Plains was a cow country during those years. Animals roamed at large. The different outfits had brands by which they were known and at round-up times the animals were separated and branded. Until 1886 I worked for these parties. During this time I lived at Laramie, became acquainted with conditions and practices of people on Laramie Plains and business there carried on. Very thoroughly familiar with it. Also thoroughly familiar with country all over Laramie Plains.

From Laramie moved over to Horse Creek and there engaged in ranging cattle and built a ranch there. I built ditches on this ranch. I surveyed them myself with a device of my own. I operated these ditches. Moved to Stuck Creek in Upper Laramie River Valley in 1890 or '91. Built a ranch there. Surveyed ditches and built them there. Used spirit level and straight edge. Used ditches I built. I abandoned them later. Ran cattle there. While

- 1911 living there traded in Laramie City. Traveled up and down the Laramie River Valley. My ranch, which was in mountains, was 38 miles from Laramie.



Then moved from Stuck Creek to my residence at Big Park. It was then unsettled country where I located. An entry had been made on land where Glendevey is located and small log cabin with dirt roof had been constructed, but parties were not living there. Big Park was then uninhabited. Located my place about  $\frac{3}{4}$  mile from Glendevey. Big Park was very dry sage-brush land.

1912 During nine years that I lived there I reclaimed it. When

I first went there it was unsettled country, not very frequently visited, except along the river where some men would ride for cattle or something like that. It was the home of nearly every wild animal that inhabited the Rocky Mountains. Elk, Deer, Bear, Mountain Sheep, and all other animals such as Martens, Fox, Coyotes, and animals of that nature, inhabited the region. There are not so many now as there used to be.

1913 There were no irrigation works there at that time. I surveyed the first ditches. I used what is known as the triangle and plumb bob. I made it myself. I first built Link Ditch No. 1. East side of river, about 2 miles long. I did both engineering and excavation. Used ditch entire time I lived there. Also surveyed and constructed Link Ditch No. 2 on west side of Laramie. Used both ditches for irrigation of sage-brush in the first place and then

later for native hay, using water to rot out sage-brush and make hay meadow. Reclaimed only portion of land under west ditch. Constructed houses and barns. Lived there until 1900. From there moved to Fort Collins. While residing at Big Park did considerable hunting through mountains surrounding. Was over the mountains a good deal. Became acquainted with the entire Laramie Valley.

Have been over and along the ridge or crest of Medicine Bow Mountains, represented on Exhibit 1, from point on inter-state line to southern extremity of Laramie River watershed. Am acquainted with general trend and course of these mountains. Location is approximately correct on Exhibit 1. Have been along divide between the Laramie river and the Cache la Poudre river.

1915 Have hunted all over it many times. Location of this Divide on Exhibit 1 is correct. There may be some slight variation. It is a good map of the country. Am acquainted with Middle Mountain. Constructed a road over it to Nunn Creek. There is a road from Big Park to Glendevey. The road runs from there easterly to Fort Collins. I have traveled that road a great many

1916 times. Traded at Fort Collins when living at Big Park. Also traded at Laramie. In going to Fort Collins went over Sand Creek Pass road, sometimes went by way of Horse Ranch Pass, and at other times by way of Boswell's Ranch down the river past Woods Landing. Used these roads in going to Fort Collins or Laramie. Went by way of Tie Siding in going to Collins.

Steep mountain sides border the Laramie Valley in Colorado. They are very abrupt.

1917 There is highway called Deadman's Canon road or State highway going from Glendevey East to Fort Collins. It runs from Glendevey west over Ute Pass over the Medicine Bow Range to

Walden. It goes through very rugged, hilly country with very long heavy grades. I had contract to build four miles of this road and constructed it for state, from head of Deadman's Creek down to upper end of Deadman Canon. I built nearly 1,000 feet of corduroy with a great many bridges—I don't remember the number. They were across little creeks. Corduroy is made by putting poles on stringers to construct road across swampy places and sloughs.

1918 Such a method is necessary in mountain roads. That kind of work is slow and tedious and quite heavy because of the amount of timber handled. These roads have to be repaired frequently.

When first moved to Big Park there was a road up the Laramie Valley which had been used for obtaining ties for railroad construction. Also to haul small amount of freight for the Water Supply & Storage Company. I improved it. Mountain roads rapidly deteriorate. Constructed other roads in Laramie Valley. Was road supervisor in District No. 3, Larimer County, Colorado. Had charge of the entire road district.

Was residing in Big Park at the time they were constructing the Sky Line Ditch of the Water Supply & Storage Company, then the Larimer County Ditch Company. Head of Sky Line Ditch is about 12 miles up-stream from Big Park. Sky Line Ditch was completed in 1892 or 1893, I believe it was on July 4th that they turned water through headgate and let it run through ditch. I was there at the time. Ditch is 5½ miles long. It took the owners three working seasons to complete this ditch after all engineering had been completed.

By working season I mean the months of each year during which work can be carried on. On account of elevation of country snow fall is very heavy. It comes early in the fall and goes off late in spring. You cannot work profitably a new enterprise in vicinity of

Sky Line Ditch before July 1. They established permanent camps, providing for closing down work each fall and opening up next year. This permits them to begin work a little earlier, possibly June 15 to July 1. Supplies are hauled in the fall before. Supplies cannot be hauled over roads until quite late in spring. You cannot commence work in mountain regions until you can haul in supplies. The time when you have to cease construction in fall is very uncertain. Have seen it cease in September, and in September of 1890 or '91 snow was so deep four horses could not pull empty wagon and operations ceased. Snows which

will prevent ditch construction usually begin about October 1 of each year. Was along the ditch during the time the Sky Line Ditch was being constructed. Sold them beef and butter, and also cut out timber for their flumes, cut logs for their saw-mill and helped to distribute lumber along ditch. Am well acquainted with location of line of East Side and West Side Collection Ditches of Greeley-Poudre Irrigation District system shown on Exhibit 1. I have known those lines for a long time. Have seen the ditches since they were in course of construction. Sky Line Ditch is built

along mountain side similar to that occupied by these two ditches.

1923 Sky Line is at higher elevation. Slope is about the same. Have observed Sky Line Ditch while in operation. They

usually begin running water in that ditch about June 10th to 15th and it continues until November 1st. I have been there when they were opening up the ditch. They cut narrow trench through snow and let the water through. Ditch fills with snow. The snow prevents running ditch in winter. It usually fills in November. When they open it up they start at the lower end near Chambers Lake. It usually takes until about July 10th before they can run the ditch

1924 full. Have been acquainted with care-takers in charge of ditch. It is necessary to carefully guard ditch during operation. Water flow fluctuates morning and evening. More

water can be carried if watched than if not. Water comes into ditch below point of intake, there are several little rivulets coming off the mountain side and two or three creeks coming in. Principal supply is obtained from West Fork of Laramie River. Have observed that water runs from 30 to 40 days over diversion dam at head works on West Fork every spring, it never fails. This occurs after they begin operation of ditch. These patrolmen of which I have spoken are engaged for purpose of taking, by means of this canal, all water possible for Chambers Lake. They are men who are acquainted with the system and this particular line of ditch. They never put a new man on that work. The water thus diverted is made available for us in Poudre Valley. This water running over spillways of which I have spoken occurs while patrolmen are watching ditch. Even in low stages of river, ditch loses parts of water diverted, by seepage. Water can be seen coming down mountain side below ditch line.

1926 Was acquainted with mountain side on which ditch was constructed. Was there first time water was run through. Seepage has since appeared below ditch. This appears now where it did not appear before ditch was built. Have been at ditch when it was taking the entire flow of West Fork. Even at such times some water appears in West Fork below diversion. Starts 300 or 400 yards below and keeps increasing, and there is always good stream of water at mouth. Seepage from this ditch is considerably more than from similar ditch on plains.

1927 Impossible to make ditch bank absolutely water-tight where it comes in contact with different rock slides and stratas. Conditions are very different from those on plains. Only difference between Sky Line Ditch and the collection ditches of the Greeley-Poudre system is that the latter are lower down on the mountain side. General mountain slopes are about the same. Those of the Greeley-Poudre system are nearer to the foot of the mountain. About the same class of materials is encountered in construction.

The same conditions which contribute to loss of water from 1928 seepage from Sky Line Canal would also obtain for canals of Greeley-Poudre system.

While living at Big Park my attention was called to efforts being made by irrigators in Poudre Valley to secure a further water sup-

ply for lands in that valley. My attention was also called to difference in value of water for irrigation purposes on lands in Poudre Valley as compared with those on Laramie Plains. That was first brought to my attention by construction of Sky Line Ditch, which I understood cost \$80,000, and when I compared small amount of water for which they expended this money, it seemed to me that many millions of dollars' worth of water might still be diverted from the Laramie River into the Cache la Poudre Valley.

I knew very well just what the Laramie Plains were valuable for. I was raised on them and rode all over them. Was very familiar with them. I knew the use to which the water of the Laramie River was put on the Laramie Plains. This also came to my attention 1929 and consideration when I worked on the Sky Line Ditch. I then realized the value of water and the great difference there must be in the value in the two regions to warrant an expenditure of so large an amount of money in the construction of that ditch.

Am acquainted with location of Greeley-Poudre tunnel. I located it. 1897 first I noticed narrow divide between Laramie and Poudre rivers at point where tunnel is now located and constructed. Was hunting one day and wounded deer. It went up draw or ravine which runs straight up mountain. On top of mountain there is little lake at head of little ravine, and I overtook deer there and killed it, and from that point could look right down west into Laramie river. I looked also off east and compared elevation of mountains on east with bed of river and on west with Laramie river and it was apparent that you would be from 600 to 800 feet higher on Laramie river side than on Poudre river side. It was apparent to eye. Place where I stood at that time is directly over where 1930 the tunnel is now constructed. At that time I figured distance through the ridge would be about  $1\frac{1}{2}$  miles. The lake at which I stood we called Deer Lake, do not know what it is called by others. Resided in Big Park about  $3\frac{1}{2}$  years after that. At that time took no steps towards completion of system. Had no funds with which to build system such as described here.

I was the originator of the entire proposition as now constructed or planned. I moved to Fort Collins in year 1901, I think it was in fall. Traded in real estate some and got some teams and that winter they raised money to construct Fossil Creek Reservoir. I hauled rip-rap for the reservoir embankment and took 12 shares of their capital stock at \$50 a share in payment. That is the irrigation reservoir constructed across the channel of Fossil Creek. Fossil Creek is a small seepage stream. Purchased a small farm in vicinity 1931 in 1901. While living there became acquainted with A. I Akin. He was farming. At that time imported to him information I possessed as to possibility of system to be constructed for diversion of water from Laramie river by means of tunnel, East and West Side Collection Ditches and Upper Collection Ditch. Explained it to him some time during spring of 1902. He was well acquainted with old irrigations in that country and had considerable experience along the line of value of water for farms. I told him what I thought

could be done up there and drew a profile of proposition, and stated if there was anything in it we would own it together. We were intending to promote that proposition.

My purpose in getting Mr. Akin interested with me was to assist in raising necessary funds to carry project into going concern and construction. Mr. Akin had been to my place at Big Park and I was better acquainted with him than I was with any other man in the Poudre Valley and my acquaintance drew me to him and we were neighbors in farming, which naturally induced me to talk with him in regard to this proposition.

1932 I explained to him the proposition and made a map or chart of it. I did not pretend to draw it with exactitude but it was in manner similar to that which had been done on ditches before. I made a sketch map. In making this sketch map I described the tunnel and the collection ditches coming to and feeding this tunnel. Akin and I took trips around Chambers Lake and down the West Fork and East Fork and camped upon what we called Salt Mounds. This is located nearly due west and about 1,000 feet distant from the west portal of the Greeley-Poudre tunnel. I explained to him the system and told him it was a large scheme and all we needed was money. We had the idea but were short of funds.

We adopted a method by which we were to build a part of the system first and employ the same to demonstrate the flow which was obtainable, and also to assist in obtaining money for further promotion. After our first trip to Link Lakes and over that country, we thought that the first thing to do would be to build this ditch and connect it up with the Sky Line Ditch, as this, being a unit

1933 of the whole, would retain our franchise and as well give us revenue to proceed in the construction of the work. It was the cheaper part as well as the best revenue earner of the whole proposition. The idea was to connect that with the Sky Line Ditch and turn it into Chambers Lake and into the Poudre. We were five days on this trip of inspection. We visited Link Lake. I explained to Mr. Akin the line I proposed for this first construction. I had never surveyed the line. I had merely made some observations. I had been over to these Link Lakes on many occasions and knew the country thoroughly. I thought I knew the comparative elevations of necessary ditch lines and also of tunnel. I showed Mr. Akin at that time the line where I thought ditch would go. Later on in that season (1902) we had the line surveyed. The line established by the survey did not vary at all from the line which I conceived and as I explained it to Mr. Akin. The variance would not be more than 100 feet. I remember the surveys made by Mr. Duvall, the engineer who testified just previous to me. The lines which he

1934 established for those lower ditches corresponded just as near as can be with the lines that we had charted. In this connection, I might say there is just one thing to do. If the topography of the country won't allow that, you might as well stop. There is no use to survey at all. If the country will permit of these things you are usually all right, but if not, you cannot overcome these conditions with a surveyor.

July, 1902, first took Mr. Akin with me to view this line, near Link Lakes. The Water Supply & Storage Company were then working somewhere in the vicinity of their Grand River Ditch. We planned to take an engineer back later in the summer and survey the proposition. Frank Beach, civil engineer, was taken up there in same summer to survey the proposition.

1935 Mr. Akin and I paid for work, bearing expense equally.

We had him first survey the Link Lake Ditch, what they call now the Upper Rawah Ditch. Survey commenced August 25, 1902. Mr. Beach, Mr. Akin and I were engaged in the work.

There were no roads or trails by which access could be had to this high mountain region where the Link Lakes are located.

1936 The country was heavily timbered and in very high mountains. In order for us to gain access to that country we packed our provisions and bedding on horses. We started from the East Fork of the Laramie and went up the West Fork for some three miles; then went up the steep mountain sides into the heavily timbered country. We passed the Sky Line headgate on our way up. From that point we went directly back into the mountains. There was no road or trail. As I went in I showed Beach a little point called Saddle Back No. 1, and told him we must come out through that point, that if we did not, it would throw us down the hill below, and if we got above that point it would throw us into heavy bowlders. This part of the ditch would have to be abandoned unless we could come through this point and another similar one. These would be what you would call controlling points. Grassy Pass was the other place.

1937 It would be impractical to build the ditch unless we could have made those two points. Little change of conditions sometimes amounts to a great deal in the mountainous country. Failure to make controlling points makes ditch construction impractical. We did not finally construct the ditch through Grassy Pass. The Beach survey ran through Grassy Pass with a cut of 35 feet for a short distance, but Mr. Duvall thought he could come around the mountain east of Grassy Pass cheaper than we could get through. We constructed the ditch the latter way.

With this exception, the ditch is built precisely on the lines that I sketched to Mr. Beach before he made his preliminary survey. 1938 It is still my idea that the ditch should have been constructed through Grassy Pass. His engineering judgment was followed. He was engineer in chief and I would not go contrary to him.

Mr. Beach, Akin and I established two or three camps in this survey. We stopped wherever was most convenient.

We were engaged about two weeks on this survey. The weather put a stop to any further surveys in the fall of 1902. We had considerable wet snow and some rain. The last week were on the work it interfered with sighting the instruments. Even that would not have stopped us but for the fact that we had accomplished what we went in there for. We left that country September 17, 1902.



1940 I went by way of Big South Fork of Cache la Poudre river. It was impossible to have done any more surveying or any more construction of any character on that portion of the system in the fall of that year. The snow fell heavy and stayed. Mr. Akin and I were still owners of the projected enterprise. We were partners and not a corporation. We were engaged in reconnoitering, laying out a system and planning methods for its projection and promotion. During winter of 1902 we talked with various irrigationists in Poudre Valley, showed our plans to them and tried to interest some of our home people in the project. The character of the enterprise was such that it required considerable capital. Mr. Akin and I were of just moderate means.

In 1903, just as soon as it was possible to get to Laramie river, I took one man, a team, provisions and camp outfits and went up there and started on construction of road from state road south to Link Lakes. At that time the State road running east and west and crossing the Laramie Valley at Glendevy post office was constructed, running from Fort Collins to North Park. I started my road from the State road near Little Jinks Creek. I bridged that creek and went back as far as I could get for the snow, and chopped the road out, did the grading, put in bridges, etc. It is mountainous country. It is part of Medicine Bow Range. It takes a good deal of work to construct roads through that country, heavy timber to contend with and mountain sides where you have to grade, little creeks and large ones that you have to bridge. It was wild, unsettled, rough mountain country.

1942 The Link Lakes which I have described are along the upper end of Upper Rawah Ditch. They are located nearly at timber line. The object of building this road was for constructing the system. It was constructed into the same ditch line where I took Akin first and afterwards the engineer, in the preceding year.

The second year we went in as soon as conditions would permit of work. It is impossible to get into that country to work before May.

1943 I constructed a pole bridge 20 feet long across Little Jinks Creek. From there cut out timber back to very steep hill which we had to grade towards Stub Creek. After getting on hill, cut timber from there to creek, there we put in bridge, about 35 feet from bank to bank. From there began to work in dead timber. We had gotten through Jack Pines, the green timber. We chopped very heavy dry poles from there up to top of McIntyre Divide. Crossed few other little creeks where put in small bridges, 4 to 12 feet across. I bridged all creeks. After arriving at the top of McIntyre Divide we turned nearly due south following dry ridge until struck heavy green timber, and side hill around which we had to grade. Course was nearly south from there to Lake No. 4, one of the Link Lakes, at head of Rawah. We made another camp and chopped a road some two or three miles ahead of us through heavy green timber. Some swamps we had to corduroy where we could not get around them. We avoided all corduroy we could. We

put bridge across Rawah about 36 feet long. In this bridge we laid heavy stringers, and then floored it with poles.

1944 We built road ahead of us and took supplies on wagon.

Would build mile or two of road ahead and move camp up as fast as road was cleared. From Lake No. 4 we built road over to Camp Lake before we moved. From there constructed road to east side of Grassy Pass. We built another camp on east side of Grassy Pass and there intended to build main commissary camp for work to south of that point, so got out a large lot of logs and dragged them up to where we intended to build our cabin. The commissary camp was a necessity in this construction. By the time we got logs all chopped, it was getting late in season and pretty cold and I brought my family, which was with me, back to Fort Collins, and while I was down there was a very heavy snow. I left Bob Lowman up there with camp. Within two weeks after I came out snow was so deep could hardly get in with outfit. This was latter part

1945 of September. Impossible to do anything further on ditch that year. Up to this time had no other financial resources than that possessed by Akin and myself. Resided in Fort Collins during winter of 1903.

1946 In fall of 1903 we started negotiating with Myron Akin to find someone who would further finance the proposition and obtained Wellington Hibbard. He resided in Nebraska at that time. Had no previous acquaintance with him. He and Mr. Myron Akin and A. I. Akin and myself and Mr. Jesse Harris met at Fort Collins. We drew up contract whereby they were each to have one-fifth interest in proposition for inducing capital to construct the whole system. This was consummated after three meetings held in

1947 Fort Collins. The line of ditches as we had designated and designed them were explained to our associates. I made charts showing lines of tunnel and platted entire proposition.

The five of us concluded we had better make survey of tunnel as early as possible and so I took team and number of men with Mr. Tenney and went up there and camped at Lanning Cabin and surveyed line for tunnel. In party were R. Q. Tenney, W. R. Lowman, Dwight Mandeville, and Cooley.

Left Fort Collins March 9th and arrived there about March 12, 1904. Took about two weeks from time we left Fort Collins. We were engaged five of six days surveying. There was a great deal of snow on tops of mountains, it averaged two feet in the Laramie valley from what we call Middle Mountain to tunnel site.

1948 Site surveyed by Tenney in practically same place previously selected by me, its location was just a matter of difference of opinion as to best place to open tunnel. Mr.

1948 Duvall thought it would be better further north where there was less slope, and he located it there. West side of this ridge, called Green Mountain, is more precipitous than east side. The western slope of the mountain at that point is about 1,000 feet high and it has a slope of about 1 to 1. The east slope is a more gradual until you get down to half or three-quarters of a mile from the crest of the mountain. It is quite steep down from there to the

portal of the tunnel. It would be almost impossible to go from the west side of the slope with pack animals. A mile or so north of the tunnel is a place where you could get up. It would be four or five miles south of the tunnel before you could get up with pack horses. After return of survey party to Fort Collins Mr. Tenney made up notes of his survey and Mr. Hedke was engaged with his figuring out distances and other like work with Mr. Tenney. We were active all along the line in raising money until about April 1. About that date it was decided I had better go back again and take men and do some work on the reservoir site which we called East Fork Reservoir and which was intended as equalizing reservoir for the tunnel. So we loaded up grub and camp outfit and went up to Lanning cabin.

Mr. Tenney ran fly line from East Fork Reservoir to tunnel. This was done about March 15th, about the same time we surveyed line over tunnel. At time Carrigan and I went back up we took surveyor's level and ran upper contour of East Fork Reservoir, took height of dam, and chopped off some timber that stood where dam site would be and then I went back down the valley with my team.

1950 It was too early to do work and much engineering with high priced engineers on account of snow. I took Bob Lowman and went back and did considerable work on East Fork Reservoir and also some work on the road up West Fork.

Mr. Duvall had been up to our camp at Link Lakes the year before when I was building road. He seemed to be a man of good practical engineering ideas and good about construction and I suggested we hire him as engineer. I knew him to be practical man for mountain ditch construction. He was then residing in Denver. His services were secured by co-partnership. Arrangements were made with him to come up and do surveying for us in May, and we were expecting him early. So took crew of men up into territory and left some of them there and came back out and got Mr. Duvall and another man and went back up and went to work surveying and making final survey of tunnel. Men had been working on road up West Fork of Laramie River all time I was gone.

Survey was carried on throughout entire summer of 1904 during which time the entire mountain system was surveyed. First commenced surveys on tunnel in May but had to discontinue on account of snow. Then surveyed up West Fork to lower end of ditch from Link Lakes. All surveys of all ditches now in course of construction were completed during summer of 1904. We had to work here and there as the snow would permit.

The line for the tunnel selected by Mr. Duvall was about the same line as selected by Mr. Tenney and myself. Lines might vary a few feet from one another. Other lines were run to ascertain which was best line.

1953 During 1904 projection was carried on by this co-partnership of five men. Considerable money was raised and ex-

pended during that year, both in surveying and construction. \$13,000 to \$14,000 was expended in surveying and construction on Link Lake properties during that summer. Upper Rawah ditch was also surveyed in 1904, final line was run and most of it cross-sectioned. The line finally selected was practically the same line as selected by Beach in 1902. The only difference would be the difference of opinions of the two engineers in getting around some obstacle. It was practically the same line described by me

1954 before first survey in my first conversation with Abe Akin.

There was great deal of construction work done in 1904 outside of surveying. All necessary clearing was done from West Fork of Laramie River for ditch across to East Fork of Laramie River and to tunnel. Considerable of ditch line was plowed and some of it finished so as to turn water into it from West Fork of river. Ditch required considerable clearing of timber at this point. Work was done on floor of Laramie valley nearly level with west portal of tunnel. Upper end of this clearing was a point lower in elevation than what is now known as West Side Collection Ditch. It was so constructed that water flowing through this latter ditch as well as from Upper Rawah, would be carried across and into tunnel. First clearing in any part of project was on East Fork Reservoir and the next clearing was on this ditch line from West Fork to the tunnel.

1955 It would be impossible to take water diverted or carried by this East Fork Reservoir or the ditch from West Fork of Laramie River to tunnel out of Laramie Valley by any other means than a tunnel. Impossible to take it out by Sky Line Ditch or other canals.

1956 Established construction camps in 1904. We excavated about 6,000 feet of canal on Upper Link Lake Ditch as we termed it, that was the original name for it. That is the same ditch as now known as Upper Rawah Ditch. We also cleared at that time about  $3\frac{1}{2}$  miles of timber.

It was necessary to construct a road up West Fork of Laramie River and from West Fork up over the mountain to meet southern end of road coming in from the north to Grassy Pass in order to construct this upper ditch line. We also did little repair work on road between Glendevy and West Fork of river. This was old tie road, constructed in 1876 along the river valley. Repairs were required. Country along West Fork and up mountain side is very hard place to build roads. Springs coming out of mountain side in some places prohibited grading and we had to build up on the lower side.

1957 Camp was established and excavation by force of men and teams was commenced on Upper Rawah Ditch about middle of July, 1904. I was in charge of outfit doing work that season. Work was continued until along in October when snow stopped us. Work was continued throughout all weather permitting excavation. Snow got so deep we could not work without clearing off ditch bank and mixing dirt with snow and this would be disastrous as it would make poor banks, so discontinued excavating and let crew

go. I stayed there longer with 5 or 6 men and continued clearing. During that year we built log cabin and store room for commissary where we expected to leave provisions during winter and have them there for spring. We did considerable of this work on this ditch with teams. On this high ditch the country is a little flatter than it is along the two West and East Side Collection Ditches lower down.

1958 Supplies were hauled in with freight teams hired to transport it to Lanning Cabin from the valley. From the cabin I had a four-horse team that hauled supplies up the mountains to the work. Did not have freighters haul provisions all way up because their horses could not handle the freight on the steep roads. The horses were not used to that character of work. I had four head of mountain horses that were raised in the mountains. Our supplies were freighted from Fort Collins.

We had a great deal of difficulty in keeping men on the work. It is work requiring a special class of men, and in selecting a crew we are rather choice of kind of man we take there, as it is of no use to take a man there and expose him to hardship and have him turn out other than serviceable.

In 1904 in prosecution of excavation and construction work on Upper Rawah Ditch we had 35 men in our camp and the contractor, Ianson, had 18 or 20 men all the time.

During that season did not use the road from the north to bring in supplies because we had not reached the territory that road was constructed to serve. All work north of Grassy Pass was to be supplied by this road from North and South of the Pass from

1959 the road we constructed up West Fork. My gang of 35 men were employed all along line from West Fork of Laramie River to Grassy Pass and around the Pass. The work was prosecuted by this force of men and the equipment that I have mentioned throughout the entire period of construction in 1904. The work ceased only when the snow got so we could not handle the timber to advantage. We left upwards of \$1500 worth of provisions in there. It is common practice to leave supplies in commissary cabins in the fall of preceding year when it is expected to further prosecute work in the following season. If supplies are left there you can get in and get to work earlier and at times when it is not possible to haul supplies.

First work of construction following any surveys on this entire mountain system, exclusive of road work, was done on East Fork Reservoir and also on line of ditch leading from West Fork of Laramie River to west portal of tunnel. In August, 1903, Lowman and I did a little ditching up on the south face of the mountain, drawing water back into the draw which we finally connected and turned Link Lake ditch down through. That would be the first place the ground was broken at all, but it was not along any survey for the reason that we did not have to survey it there. It was on side of mountain and along line of creek that ran below and we connected it and threw it into the course that the water would

come down after we turned water in the upper ditch. The first work along any surveyed line was done on East Fork Reservoir and on ditch leading from West Fork of Laramie River to the tunnel. I mean work of excavation done on the ditch the survey of which had been located and cross-sectioned by engineer. Following close of construction work on account of snow in October, 1904, we returned to Fort Collins.

Snow interfered with road construction work in 1903. We started from the north and worked south as far as snow would let us in spring. When we got to where snow was too heavy for us we went back to valley. Snow was in this condition in June. July 9th, took family and regular mountain outfit and two teams and men and we went back and continued road work.

1961 It was recognized by me and by my associates that it would be necessary to locate ditches and works upon plains of Poudre Valley as well as to construct ditches in mountains.

Poudre Valley Ditch had been constructed out of mouth of Poudre Canon in 1902. I have viewed lands that might be served from extension of this canal. I was along at time survey was made of such extension by Mr. Charles R. Hedke, engineer. He is same engineer who assisted Tenney in checking notes of original survey. He is witness who preceded me in this case.

In 1905 expenditure of both money and time was made in investigation of territory in Cache la Poudre Valley in which to make use and application of water to be obtained by means of the Laramie River system. I was engaged in this work as well as in work in the mountains during that year. Was in mountains during all fore part of season and later in summer we came down and ran survey from reservoirs 5 and 6 of the North Poudre system down to Union Pacific Railroad and beyond. The reservoirs 5 and 6 are capable of being filled from the Poudre Valley Canal.

1962 Poudre Valley Canal is upper end of ditch for carriage of water from Poudre River in Cache la Poudre Valley to the Greeley-Poudre Irrigation District. Mr. Hedke made two surveys from Reservoirs 5 and 6 for an extension of Poudre Valley ditch to Union Pacific Railroad and beyond. Generally speaking this line of survey is indicated by the ditch line leading out towards McGrew Reservoir and shown on the map Exhibit 1 attached to answer of corporate defendants.

In 1904 the principal place of business of those interested in this project was in Fort Collins. Mr. Hibbard was financial promoter of proposition. He resided all the time in Fort Collins after entering into project. He engaged in no other business than the projection of this system and was continually employed in promoting it. He made several trips east, met people, financial firms, and bond brokers, to promote the proposition and raise money.

1963 The co-partnership had engineers in field the most of the time from 1904 on. Concerning surveys made in 1905, will state that I heard testimony of the witness Charles R. Hedke, who just preceded me. The surveys as he described them for the year 1905 works are correct. He was the engineer who did the surveying.



During 1905 parties were brought to view the works in its different extents and parts. Principally Mr. Lawrence and a man by the name of Bethune came out to see the proposition and were pleased with it and were going back to finish up deals. Mr. Lawrence and Mr. Hibbard went to Chicago to consummate the deal but Mr. Bethune died in Springfield on his way back and that stopped the financial negotiations with them. Lawrence was an engineer.

Walter Fox came out in the interest of Swift and Donovan 1964 of Chicago. They came out after Mr. Fox had been over the proposition with me and had taken six weeks to make up report on entire proposition, land, water and all. It was quite late in summer by the time they got there.

In 1905 I was in mountains from about April 1 until sometime in August or latter part of July. Excavation work was not going on in mountains during that summer. We did not have the funds. Mr. Hedke came up with Ianson in 1905 and viewed the work Ianson had done on Upper Rawah Ditch. Hedke measured it and settled a dispute between us and the contractor concerning estimates. My only interest in those mountains was caring for the property of the co-partnership in that locality. I was engaged all summer in caring for the ditches and other work. On the contract work I personally had all of the clearing of the right of way from 1965 boulders and large rocks. Method of removing solid rock depended entirely on mountain sides. We undermined rock on lower side and put giant powder on upper side and thereby rolled rock out of way. By this method we rolled rocks 10 feet square out of right — Upper Rawah Ditch.

In 1906 I was still connected with enterprise, but during that year I disposed of my interest in project. During that year, work of financing, surveying and planning was going on continually.

During 1902, while working on the Upper Rawah or Link Ditch with Mr. Akin, I took a number of photographs.

Defendants' Exhibit 52, a photograph, was taken July 1, 1902, by Mr. Akin and subject is myself and Camp Lake. Camp Lake is one of Link Lakes. This Photograph was taken at time I was showing Mr. Akin line of Upper Rawah Ditch before any survey.

Defendants' Exhibit 53, is photograph taken in July, 1902, on same day as Exhibit 52. It is a picture of West Fork of Laramie River, the whole country on the West Fork of Laramie River looking west to Medicine Bow Range. The snow covered peak showing in background of picture is crest of Medicine Bow Range, and is extreme west end of watershed of West Fork of Laramie River. This range is dividing line between Laramie River and North Park. View in picture is taken from east looking west.

Defendants' Exhibit 54 is photograph taken by Mr. Akin in July 1902 on same day that Exhibits 52 and 53 were taken, showing the mountain higher up, looking off into the head of the West Fork of the Laramie River, and showing my saddle horse with bed tied behind saddle. That is saddle horse I used in showing him the country, and when we were climbing the mountains to get back to the place.

Defendants' Exhibit 55 is photograph taken by Mr. Akin on day succeeding taking of Exhibit- 52, 53 and 54, and shows snow bank along crest of Medicine Bow Range. I am standing on snow bank. Locality where picture was taken is on divide between Laramie Valley and head of North Platte River. It is above Chambers Lake. The drift is a bank of perpetual snow. The water running from this snow bank drains into Rawah Creek.

Defendants' Exhibit 56 is photograph taken by myself in August 1903 and shows four head of horses. Location is on east side of Grassy Pass and represents our road camp and is just short distance above commissary cabin. View is looking east. Photograph generally shows character of mountain and timber country through which these roads were constructed. Upper Rawah Ditch goes around mountain on left hand of picture, goes to east and across Billy Creek to center of picture.

Defendants' Exhibit 57 is photograph taken by me in 1903 during summer. It is photograph of Link Lake No. 2 at head of Rawah Creek and above where point of Upper Rawah Ditch comes out of Rawah Creek. View is looking southeast. Part of Medicine Bow Range near timber line is shown in picture. Picture taken in August. Snow appearing in crevices and depressions of Medicine Bow Ranges are perpetual. The lake is No. 2 of the Link Lake System.

Defendants' Exhibit 58 was taken in July, 1903, and shows Link Lake No. 3 of the Link Lake System. I took picture. View is looking east.

Defendants' Exhibit 59 is photograph taken about the same time as Exhibit 58. Taken in August 1903. Shows Lake No. 5 of Link Lake System. Direction looking east.

Defendants' Exhibit 60 is photograph taken by me at same time and is picture of Lake No. 7 of Link Lake System. Direction northeast towards outlet of lake.

1970 Defendants' Exhibit 61 is photograph of Lake No. 8 taken two weeks later by me. Latter part of August, 1903.

Defendants' Exhibit 62 is picture of same lake, No. 8.

Defendants' Exhibit 63 is photograph of Lake 9 of Link Lake System. Mountains near background are near crest of Medicine Bow Range. I am standing to right of picture. Taken July 1903. Snows shown in background are perpetual.

Defendants' Exhibit 64 was taken latter part of August, 1903. It shows my road camp with myself, Robert Lowman and my little girl, J. C. O'Connor, and Billy Briggs. This camp is on east side of Grassy Pass and near junction of the two roads, the one from the south from the West Fork, and the other from the north from the State road. This is the furthest camp south we established in 1903, when constructing roads. It is where we were when we were snowed in in September.

1971 Defendants' Exhibits 55 to 64 inclusive show general character of the timber mountain country in which it is necessary to construct the collection ditches described. The same mountain range, and character of country extends to the north into Wyoming.

There were no existing roads or means of travel into that country, prior to the roads which I constructed for the purpose described in 1903 and 1904. There was never a wagon in there until we built that road. No men have habitations in that region.

Defendants' Exhibit 65 is a photograph showing first survey from Laramie River Tunnel, taken by me in March, 1904. Shows the surveyor's chain and the tracks of the head rod man and Mr. R. Q. Tenney. Black line along snow is surveyor's chain. Location is along shore of Emerald Lake lying directly over

1972 Laramie River Tunnel on crest of Green Mountain Range. Picture taken during Tenney's survey looking west over to Medicine Bow Range.

Defendants' Exhibit 66 is photograph taken in July, 1904, by me. Shows surveying crew which I had on Laramie River in 1904. Men in picture are Myron Akin, Wellington Hibbard, Zac T. Duvall, engineer, William Carrigan, Edward Sisson, Robert Lowman, Burnette Jordan and Dwight Mandeville, and another man. It shows our wagons. View is looking east down West Fork of Laramie River. Shows main surveying party employed in 1904 in making surveys of system in Laramie River Region, including tunnel.

Defendants' Exhibit 67 is photograph taken by me and showing Lanning Cabin on Laramie River below where tunnel is now located. It is on floor of Laramie River Valley. Mountains in background preclude view of Medicine Bow Range. This is cabin used as transfer or commissary cabin. West Side Collection Ditch leading to the tunnel comes right around the mountain side shown in picture.

Defendants' Exhibit 68 taken June, 1904, by me. Cabin is cabin No. 1, a transfer cabin part way up mountain side from the Sky Line Ditch on top of mountain, where Link Lake Ditch drops over the mountain side down into West Fork. Cabin was built June 1, 1904, under my supervision. Men in photograph are "Old Ben," Billy Carrigan, Dwight Mandeville, Zac T. Duvall, engineer, Burnette Jordan, and Robert Lowman. All these parties were working at that time on the system. The cabin was one of the necessities for construction.

Defendants' Exhibit 69 is photograph of main commissary cabin. Taken by me October 1, 1904. The two men in picture are Duxbury and Jordan. Cabin is located on line of Upper Rawah 1974 Ditch. Its construction was necessary for use in constructing canals. Stored supplies in it for coming season.

Defendants' Exhibit 70 is photograph taken October 1, 1904. Men in picture are working under me in Upper Rawah Ditch. I am in picture but men are too numerous to name. Location is near commissary cabin on Upper Rawah Ditch. This gang worked on clearing a right of way for the canal. These are the company's men. Contractor's men are not shown. They were engaged in another place. They had their own camp.

Defendants' Exhibit 71 taken August, 1904, and showing teams of Mr. Ianson, contractor engaged in construction work on Upper Rawah Ditch. Also shows his horse tent and part of his sleeping

1975 tent. Shows a plow team and one of his slip teams. Taken during prosecution of excavation work on Upper Rawah Ditch at location little south of where my crew was working.

Defendants' Exhibit 72 taken about July 12, 1904, at Glendevey. Team shown is mine and load of supplies and tools for construction gang on Upper Rawah Ditch. Man driving is Robert Lowman. Supplies were hauled from Fort Collins for use on Upper Rawah Ditch. Photo shows one of four horse teams. This team belongs to me.

Throughout my testimony wherever I have frequently mentioned the Link Lakes Ditch I refer to the same ditch sometimes known as the Greeley-Poudre system described as the Upper Rawah Ditch. The collection ditches of the system are three in number. They are the Upper Rawah Ditch, which I called the original Link Lake Ditch, and the lower Rawah Ditch which comes out down near the Laramie River and goes back to the the tunnel, and the Deadman Ditch or East Side Collection Ditch which runs from Dead-

1976 man Creek to the tunnel.

Defendants' Exhibit 73 is photograph taken in June, 1904, by me. Shows flume on Sky Line Ditch about a mile and three quarters below headgate where ditch is taken out of West Fork of Laramie River. Construction work shown in this picture is similar to that required along the line of the West Side and East Side Collection Ditches of the Greeley-Poudre system, except that the latter are nearer the foot of the mountain. Direction in photograph is nearly south. Observer is looking at the East Fork of Laramie River and towards Chambers Lake, about 2½ miles from observer. The Laramie River tunnel of Greeley-Poudre irrigation district is northeast of point at which observer is standing. Mountains shown on east side of picture are part of Green Mountain Range, through which tunnel runs.

Defendants offer in evidence their exhibits 52 to 73 inclusive with privilege of substitution of copies.

I used Link Ditch for irrigation for Big Park for a number of years. Constructed in 1894 and irrigated about 100 acres. Constructed Link Ditch No. 2 in 1896. It has been in use ever since. Serves about 50 or 60 acres. Constructed for reclamation of sage brush and willow land in the meadow.

1978 The land is only suitable for hay land owing to the altitude.

During time I resided on Laramie River I observed difference at season of year when high flows occurred in streams emptying in from the east side and west side of the drainage area. The creeks draining from the east side of the valley run earlier and cease sooner than those from the west side. I have known the high water from the east side to start in April while at the same time the west side had not started. The freshet from the east side continues from 30 to 40 days. During this time the rise on the west side

1979 would hardly be noticeable. The flow on the west side begins to rise about the time of the fall of the freshet flow on

the east side. On the west side begins about latter part of May and continues to run up until July 4. Runs 60 to 70 days. About three months is usually consumed between the first rise on the east side and the close of the freshet on the west side. It varies with 1980 years. The flow rises and falls with the temperature. In cool days the flow is less than on warm days.

Deadman Creek, including its tributary Nunn Creek, supplies possibly a greater amount of water to the stream than Stuck Creek which lies to the north and near the state line, although the latter creek runs so rapidly it is very hard to judge as to the volume of water in it. Stuck creek is a stream of heavy flow. The 1981 other streams of continuous discharge into the Laramie River in Colorado not intercepted by Greeley-Poudre system are all larger than Deadman Creek. They are Grace La Garde, Stuck and Beaver Creeks. There is no comparison between these creeks and Deadman. Forrester and Fox Creeks are good flowing streams but not so large. In Wyoming are Beaver and Johnson Creeks, which are quite similar to Deadman, but are not to be classed at all with any of these other creeks. Taking all these other creeks together they make a good amount of water. McIntyre Creek is a great deal larger than Deadman Creek. The amount of water intercepted by the Greeley-Poudre system of works at the upper end of the McIntyre would make no appreciable difference in the flow of the stream. There are a number of smaller streams which flow into the Laramie river from the west side, northerly from the Greeley-Poudre system.

Am acquainted with Sand Creek. It is tributary of the Laramie River, rising in Colorado, no part of which is intercepted by the Greeley-Poudre system. It continuously flows water into the State of Wyoming from the Colorado watershed. Jimmy Creek drains land on east side of the Laramie River watershed in Colorado and discharges into the river. No part of it is intercepted by any of the Greeley-Poudre system.

Cross-examination by Mr. N. E. Corthell:

1982 When I lived in the Laramie Valley I was engaged in the farming, ranching and cattle business, the kind of ranching business that is carried on in the valley, covering between eight and nine years, in Big Park, and about a year and a half on Stuck Creek. After selling out I bought a farm in the 1983 Poudre Valley south of the Poudre River, about  $3\frac{1}{2}$  miles from Fort Collins. I worked on that farm one summer, and sold it less than a year after bought it. Since that time I have lived in Fort Collins. I was living in Fort Collins, but still owned the farm, when I interested Mr. Akin in the Laramie River Project, and went up to look over the ground. At that time we did not know upon what land we should use the water. We first had in mind the use of a part of the water upon land in the neighborhood where my farm was located. There is a general feeling on the part of the owners of land under all of the 1984 ditches in the Poudre Valley that more water is needed, and generally speaking, it was the shortage of water in the valley

that led me to consider this proposition. My idea was to obtain a supplemental supply in addition to the water furnished from the Poudre River, and to use this, if there was enough, upon other lands.

1985 My attention was directed to the region of the present Poudre-Poudre Irrigation District when I made my first acquaintance with the Poudre Valley, and I first thought of this project in connection with the Laramie River diversion in the summer of 1904, the suggestion coming from Mr. Hibbard and Mr. [redacted] after our partnership was planned in 1903, November. The partnership was formed and contracts drawn up in the winter of 1903-4, and I sold out in 1906.

1986 There were a number of personal differences of opinion and personal dislikes which led to my selling out. One reason was the objection to the plan which had then been adopted and was continually carried out, of securing an interest in the Poudre Valley [redacted] and extending that ditch to the land we intended to irrigate.

1987 Mr. Hibbard had the duty of finding capital for the enterprise, and up to the time I sold out, he had not succeeded in finding it. When I was in the enterprise we had not considered any [redacted] conditions. We had counted only on the cost of the Laramie River project, and we had not gone into the Poudre Valley and the matter, and when I sold out I had no interests in the project, nor the Poudre River, my interest being confined to the [redacted] of diverting water from the Laramie River.

1988 The cost of the work which I had planned was estimated at about \$2,000,000. In 1903 no money was expended on diverting. In 1904 about \$14,000 was expended on construction work and clearing, but not including surveys, and no money was expended on construction work in 1905. I cannot say as to 1906. I do not know how much was spent on engineering in those two years. Up to the close of 1906 the entire amount expended on construction work was \$14,000, but this does not include expenses of roads and cost of transportation, moving, and establishing camps, all of which I believe should be included in construction work, and which would bring the total expenditures in the mountains up to \$18,000 or perhaps \$20,000. This work was practically all done on the

1989 Upper Rawah and Link ditches. No considerable amount was expended on the Lower Rawah or the West Side ditches nor on the tunnel or reservoir, but about \$1,300 or \$1,400 was expended on the East Fork Reservoir.

1990 Surveys for the system were entirely completed in 1904.

In 1876 a road was constructed running the entire length of the valley, by a tie outfit, the road extending from above the tunnel to Laramie City. This road was afterwards used by the ranchmen in the valley, who kept cattle on the range, feeding them during storms and bad weather from November until the first of May,

1991 during which time cattle find little grass. During most winters these ranchmen are able to travel by this road down the river to Laramie City, but there have been seasons when the



people living above the mouth of Nunn Creek could not travel with horses. Below Glendevy the country is open in the winter.

1992 I know the general location of the Laramie, Hahns Peak and Pacific Railroad which extends over this same range of mountains west of the Laramie River, about thirty miles from Davy's (Glendevy) to Fox Park on this road. In passing over the mountains, this railroad rises to an elevation of about 9,000 feet. The Denver Northwestern and Pacific Railroad, sometimes known as the Moffat Road, also crosses this general range of mountains about fifty miles south of the tunnel, I should say, rising to an elevation

1993 I believe of nearly 12,000 feet. The Laramie Hahns Peak and Pacific Railroad was being built about 1911. I do not know whether work was prosecuted on either of these two roads continuously during the entire year.

1994 My plan in developing this work was to commence near the point of intersection with the Sky Line Ditch and extend the line of that ditch northwesterly as funds for that purpose were obtained, in order to tap the drainage area lying above the ditch line and to carry the water from that area through the Sky Line Ditch into the Poudre Valley. If this plan had been carried out I would have been able to get an increasing amount of water as the work was extended, and the work done in 1904 was planned with that end in view. A connection was made with the Sky Line Ditch, and 30 second feet or possibly 75 second feet was carried by the Upper Rawah Ditch into a gulch at the lower end of that ditch, running through that gulch into the West Fork of the Laramie River at a point above the diversion works of the Sky Line Ditch, and in this way the connection was made with the Sky Line Ditch and water was carried into the Sky Line Ditch. I never saw any of this water diverted into the Sky Line Ditch, but I do not see how it could avoid being taken in. We cut a ditch across a small flat near the West Fork of the River, but never diverted water from the Upper Rawah Ditch into it. I do not know whether any connection with the Upper Rawah Ditch was ever made.

1996 We originally planned to use some of the water diverted through the Upper Rawah Ditch and Sky Line Ditch into the Poudre River ourselves, either directly or through an exchange system, and to sell the rest of it for a supplemental supply for other lands, and thereby secure funds to help work out the rest of the Laramie River diversion system, including the tunnel. This plan has not been carried out, and no water was sold at any time. The Upper Rawah Ditch as originally planned was to be about seven miles long and about 6,000 feet of this was completed in 1904, and work of clearing and other work was done for about three miles. No further work was done in 1905 or 1906. The work of excavation in that country is a small part of the work of construction.

1998 Mr. Duvall and I once measured the flow of Rawah Creek, and in a rough way I have sought to ascertain the flow of the other creeks and have compared their flow with that of the Rawah. I never kept any record of the flow, and my testimony as to the general size and volume of these tributary creeks is based from obser-

vation of the flow of the streams at different times, and by a comparison in my mind of those streams with others which I have seen measured. Stream flow records were taken by some government engineers.

Cross-examination by Mr. John D. Clark:

- 1999     Practically all of the irrigated land in the Laramie Valley in Colorado is native hay land from which the hay is cut. Until I left that country I was quite familiar with all the meadows, but cannot estimate the total acreage irrigated, although it is several thousand acres. The irrigated places commencing at the State line are the Bliler ranch, the Martin or Grace Creek ranch, Mansfield ranch, Jim Detro's lower meadow, Tamerlane Forrester's meadow, Jim Detro's upper meadow, the Harry Tatham ranch including a portion of the O. P. Yelton ranch, the Joe Smith ranch, also including a portion of the O. P. Yelton ranch, Gleneyre, Homer, Pollock's ranch, the Gleneyre ranch upper meadow, Jim Smith's ranch, the Baldwin Ranch, Davy's Blennerhassett, Davy's Glendevey ranch, the Victor Stuart Ranch, the Harris Ranch, the Shipp Ranch, the Fortune Ranch, the John McNabb ranch, the Springer ranch and the Lanning ranch, the last few named being above Glendevey. The irrigation commences a couple of miles or so below the tunnel and increases below Glendevey, where the valley widens. All of these ranches are principally in the floor of the valley. The land most remote from the river which is irrigated is Elton Mansfield's place, which is on a sage brush flat about a mile and a quarter from the river. Parts of the Forrester, the Detro, and the Tatham ranches are irrigated from tributary streams. Practically all of the land which can be irrigated has been placed under irrigation, although perhaps 500 acres would be available if a diversion high up on the stream should be made onto the sage brush flats, but only native hay could be grown, and this would not justify the expense. The total acreage in the Laramie Valley in Colorado that could be irrigated is very small, and substantially all of it that can be profitably irrigated has been placed under irrigation.
- 2002     We had an arrangement with the owners of the Sky Line Ditch to carry our water for a percentage. About 130 second feet had previously been carried through their ditch, which was practically its capacity, and we had no arrangement for its enlargement. During the flood period in May and June the owners of that ditch had enough water to fill it, and we would have none of our water carried through it during that time.
- 2003     The West Side Collection Ditch was included in the plans perfected by me, and as constructed, does not perform all of the duties which would be performed by the Upper Rawah Ditch. The seepage on the mountain sides is very great, and it is always advisable to turn the water into a direct channel as soon as possible, and a large part of the water which would be caught by the Upper Rawah Ditch would be lost if it were not picked up above the West Side

- Ditch. The amount of such loss could not be ascertained. I do not believe that the plans of the Greeley-Poudre Irrigation District contemplate the use of the West Side Ditch alone, and I know the District spent several thousand dollars in construction work on the Upper Rawah Ditch. We did not contemplate a smaller Upper Collection ditch on the east side because the mountain was lower, causing a smaller run-off tributary to such an upper ditch, and there are a great many canons, making the cost of construction excessive. I would have constructed the Upper Rawah Ditch under any circumstances, partly in order to conserve the water as stated, and partly to secure a current revenue through the carriage of the water through the Sky Line Ditch.
- 2004 The Upper Rawah Ditch, as I planned it, should not cost over \$20,000. \$14,000 was expended on this ditch and the roads, and about one sixth of its length has been completed, and a great deal of the expensive part of the work, such as building roads, establishing camps, etc., was included, and a further expenditure of \$6,000 might not be enough to complete the ditch.
- 2005 The principal object in constructing the Upper Rawah Ditch at that time was to secure a revenue from it, during the time we were engaged in the larger work. We knew that with it completed it would be only a matter of a short time until we could secure the investment of capital for the construction of the whole system, and we considered the Upper Rawah Ditch as a good investment at any rate.
- 2006 From 1902 until I severed my connection with the enterprise, my associates and I were consulting with men interested in irrigation projects in order to interest them in this system, and we also approached farmers on both sides of the Poudre River from the upper end of the valley down to the mouth of the river in order to induce them to take water from us both as a supplemental supply and for the reclamation of new lands. Our estimate that the system we proposed would cost about \$2,000,000 was made in the fall of 1902, and we had no occasion thereafter to change this estimate. This estimate covered the Upper Rawah Ditch, the Lower Rawah Ditch and the East Side Collection Ditch, in fact the mountain end of the whole proposition. I never made any estimate on the work on the east side of the mountains. We anticipated that we would get an average flow of about 200 second feet for this expenditure. We knew that in the winter time we would not get this amount, but contemplated the storage of a portion, either in the mountains or in the Poudre Valley. We estimated that it would cost us \$30,000 to construct a ditch which we surveyed in 1905, which we called the High Line Ditch, covering lands on the south side of the Poudre River and south of Fort Collins.
- 2009 The construction of this ditch was not still in contemplation at the time I severed my connections with the enterprise. The other possible construction work in the Poudre Valley which we contemplated was the extension of the Poudre Valley Ditch, which Mr. Hedke and I surveyed in 1905 and 1906, but the survey of which was not completed while I was interested in the project. I do not

know what the estimates on this ditch were. Mr. Hedke  
 2010 first became connected with this enterprise when he went  
 over Mr. Tenney's notes on the tunnel, and later he was em-  
 ployed by the contractor to check up the work on the Upper Rawah  
 Ditch, and by the partnership on the survey of the Poudre Valley  
 Ditch extension.

The extension of the Poudre Valley Ditch was brought to our at-  
 tention by Mr. Hibbard, who became interested with us in the  
 winter of 1903-4. The preliminary survey was commenced in 1905,  
 and was not completed when I sold out my interest in the project.

It was determined to carry this Poudre Valley Ditch exten-  
 2011 sion out at that time.

I am familiar with the File No. 1417, made in the name  
 2012 of Myron H. Akin in May, 1904, covering the tunnel, the  
 East Fork Reservoir and other portions of this system. At  
 2013 the time this was made the two lower supply ditches were  
 contemplated, but surveys had not yet been commenced.

We had included the cost of these lower ditches in our estimate of  
 \$2,000,000 to cover the whole mountain system, but did not have  
 any separate estimate of their cost. The estimate of the cost of  
 the ditches and tunnel as shown on this filing is \$189,200, but I  
 do not know who made it, and to my mind it is unreasonable.

I am thoroughly familiar with filing No. 1722, made Octo-  
 2014 ber 6, 1904, in the name of Harry L. Munroe. This was  
 made on behalf of our association. It shows the tunnel, the West  
 Side Supply Ditch, the East Side Supply Ditch and the Upper  
 Rawah Ditch, and was made for the purpose of combining our en-  
 tire project as it was then contemplated. The estimated cost of the  
 whole project is given in this filing as \$375,000. This was the last  
 filing made by our partnership before I left it.

Redirect examination by Mr. Charles S. Tew:

Am acquainted with ranches in Laramie Valley in Colo-  
 2015 rado. In response to certain questions on cross-examination  
 I listed meadows and ranches in the valley and the owners. Testi-  
 mony pertained to ranches irrigated from the main stream, except  
 in one little variation where I spoke of small piece of meadow  
 belonging to Mr. Tatham and Detro and also Mr. Forrester, these  
 are irrigated to a certain extent from a small ditch out of La Garde  
 Creek. Up these side streams or tributaries there are small ranches.  
 They are all small hay ranches. They are devoted to hay raising  
 because of the elevation. That condition prevails throughout the  
 tributary valleys in Colorado. It is the only agriculture  
 2016 that is carried on. That condition does not change with the  
 crossing of the interstate line. The same condition con-  
 tinues on down to the lower or northerly end of the Laramie Plains.  
 The yield of the hay on these meadow lands is about the same as  
 on the Laramie Plains.

The Laramie River has much less fall and is not so rapid as it  
 crosses the Laramie Plains as has the Cache la Poudre River on  
 the easterly side. I have been familiar with the culture of wild

grasses for hay for about thirty years. My observations of their practices and results did not cease with my moving to Big Park. I went up and down the river to Laramie City. Had opportunity to notice results of climatic influences on conditions in summer.

2017 Speaking of snow fall, there is a greater difference between the fall southerly from a point about three miles north of Glendevey than from that point down the river. From that point south the snow begins to get quite deep and generally increases as you go up the river.

The wind conditions on the Laramie Plains have something to do with the lay of the snow. If we had as much wind on the Laramie as they have on the plains, there would be less snow on the level. The wind on the plains is generally continuous. The hardest current begins about at the south end of Sheep Mountain and is general from there north over the entire country. This mountain is near the southern end of the Laramie Plains. It is located near Woods Landing. The Plains extend considerably south of that point, but in going down to Laramie there is where you strike the Plains first. The wind does not blow as hard there, generally speaking, as it does lower down.

2018 There are no trees of any size on this high country called the Laramie Plains. Only cottonwood along the streams, principally on Big Laramie. There are few cottonwoods on Little Laramie. There is nothing to break the wind except the range grasses.

There are very good ranches on the Laramie Plains of a natural meadow along the Big and Little Laramie. They are all native hay meadows. The ranch business is similar to the business along the river in the upper regions of the stream in Colorado. It is carried on in the same way. Grasses are grown for hay. Hay is put up in the summer to prevent starvation in the winter.

Seasonal conditions govern irrigation on hay meadows on Laramie Plains. If season is cold and damp they don't usually put water on as early as when seasons are dry. Water is usually taken from stream about middle of May and turned off about July 10, not later than that. My description applies to meadows of natural hay. The principal portion of the land which is irrigated is devoted to that.

2019 There is sage brush flat of about 500 acres in upper valley of Colorado that might be reached by ditch from river. It would be fitted only for native hay. Crop is not sufficiently valuable to warrant expenditure of money necessary to construct works to irrigate this flat. The flat is much better soil than on the Laramie Plains, unless it might possibly be in one vicinity.

2020 I spoke of some maps exhibited to me with statements of estimated cost. These were not statements made by me concerning cost. I did not have charge of preparing surveys and descriptions of ditch lines. I was the explorer in a sense, the forerunner of the proposition and directed where those lines should

be run. If we could not have made our objective point, the tunnel, from those streams, then it would not be feasible.

In the spring the Sky Line Ditch is first opened at what 2021 they called Three Quarter Creek. They then open up ditch above that point by shoveling for the entire length. They cut a trench through the snow in order to get the water through to cut the snow with water, and they continue that on to the head of the ditch and it is very often June 15 before we get the water running. During this time the water in the West Fork of the Laramie River is running down the stream. I was thoroughly familiar with this condition and practice for many years prior to the time when I designed the work in 1902, described in my testimony.

The carrying capacity of Sky Line Ditch is about 130 cubic feet per second. That is not supplied entirely from West Fork of Laramie River. There are times, after canal is opened, during which it cannot carry all the flow of the West Fork.

I had no purpose to enlarge this Sky Line Ditch nor right to enlarge it in any of my plans. I could not have used that canal in any year, either temporarily or otherwise, until the ditch 2022 was fully opened to the head gate. This canal is burdened to its full capacity until July 15 of each year and we could not have obtained carrying capacity in the ditch prior to that date. After that date it might be possible for them to have carried some other water. We would never have been able to obtain carrying capacity in the canal to its capacity of 130 cubic feet per second. They would have always had at least 30 cubic feet of water in their ditch from the West Fork. All the water that we were intending to carry in the Upper Rawah Ditch would be carried through the tunnel to the east side. Upper Rawah Ditch was built to carry 200 cubic feet per second, it was planned to do that. Waters of 2023 that ditch when running to its capacity, could not be carried, except as to a minor portion, through the unused capacity of the Sky Line Ditch. This carriage could also have occurred only in a small part of the irrigation season. Just a short time in the summer.

It was not our plan to use the Sky Line Ditch as a permanent means of conveying water from the Upper Rawah Ditch. We would not have built the Link Lake Ditch or Upper Rawah Ditch to carry 200 cubic feet per second, when we knew that the company owning the Sky Line Ditch would not enlarge their ditch. We did not feel that it would be feasible to enlarge their ditch to carry the water on account of the kind of construction involved. One of objects of building this ditch was to carry water into Poudre Valley during time remainder of construction was going on. That was not the only reason for constructing this ditch first. The object was to construct the Upper Rawah Ditch first, to demonstrate that there was a water supply that could be obtained and carried into the Poudre Valley. The water which we could gather in Upper Rawah Ditch and carry through the limit of unused capacity of Sky Line Ditch would not bring sufficient return to warrant all the construction work necessary on this whole system as I have described.



2024 If Upper Rawah Ditch had not been completed, then the West Side or Lower Collection Ditch should be completed to a very much greater carrying capacity than now planned. It is far more feasible, considering the mountainous conditions in that vicinity, to build the two ditches on the west side of the river as now planned than it would be to build one large ditch where the lower ditch is constructed and of sufficient capacity to handle the water now carried by both the ditches. It is much safer to divide the capacity in the way it has been done. By this means more  
2025 water is captured, conserved and conveyed to the point desired and a great deal more rapidly than it would be on a single line lower down. Then you have two capacities instead of one, if one should break the other would be working. Water means money; that is the purpose for which we were constructing the ditches.

All these matters were considered and talked over by me with my associates when we commenced construction of this upper ditch. Mr. A. I. Akin and I met with considerable opposition with regard to this upper ditch but we insisted on building this upper ditch because our knowledge of conditions was superior to that of our associates. We had better knowledge of conditions of water flow in different streams intercepted and requirements of diverting this water. Also recognized necessity of intercepting the seepage water and conveying it to point where we wished it.

Following the plan advocated by Akin and myself, work was done on Upper Rawah Ditch first. That was in 1904 and continued in 1907. This upper ditch was sold later to the Greeley-Poudre Irrigation District.

2026 When I spoke of the water being turned into Poudre Valley to supplement supplies there, I did not mean it was to be applied to lands already irrigated. It was intended for new lands as well as supplemental supplies for old lands. It was not necessary at the outset to choose the particular area on which the water should go. There is large area of arid land in Poudre Valley fitted for agricultural purposes. There is demand for water as soon as it is obtainable by any possible arrangement. As new waters are obtained, old ditches are sometimes extended to cover lands possible of reclamation at their lower ends. Ditches sometimes are built to take in new areas. The supply of land fitted for agriculture by irrigation is very great. When we did our work in 1902 we knew there was a large area which could be served by ditch on south side of river. They have since covered a portion of this area through the Loudon Ditch. We also figured on something like 17,000 acres south of river, and so had Mr. Tenney and Mr. Duvall survey ditch around above Pleasant Valley Ditch. Although we knew  
2027 these areas generally, we had made no detailed observations from which we could ascertain cost of construction of ditches to them. We also knew there was area which could be reached by ditch on north side of Poudre River and lying above the then irrigated area of the valley. The requirements of ditches to reach these lands could only be determined by survey. This my associates

and I proceeded to do. This work was in management of other hands than mine. I had charge of the mountain end of project, not the plains. The problem as to just what lands in Poudre Valley this water could best be conveyed could only be determined by survey, expense and investigation covering considerable time. Even older ditches are still doing that kind of work.

This kind of work was going on under engineers and continued through 1905, 1906 and 1907. It will continue for years. It has never been fully completed in any irrigation sections that I know of.

I knew that Poudre Valley Canal was constructed for purpose, so far as possible, of reaching new areas and was being constructed in 1902, 1903 and 1904. I think it was started in winter of 1901. That canal leads towards the lands now included in the Greeley-Poudre Irrigation District. That is same canal my associates and I extended as the Laramie-Poudre canal. Was on two surveys of extension of that line.

Redirect examination by Mr. Delph E. Carpenter:

In my cross examination I referred to filing 1722 which is same as Defendants' Exhibit 51, made by Harry L. Monroe. That is same filing identified by Mr. Duvall and pertaining to surveys made by him. This map does not pretend to show anything else than surveys made by Mr. Duvall.

Also referred to filing 1417, State Engineer's office number. That pertained to Mr. Tenney's survey and the contour line of East Fork Reservoir survey made by me. The tunnel line is Tenney's 2029 survey. The tie lines of west portal of tunnel are Mr. Tenney's Alstotie lines from west portal to dam side of Reservoir. This map is signed by R. Q. Tenney as engineer; so far lines I have described as surveyed by him, this merely attempts to show those lines and nothing else, outside of East Fork Reservoir. If this reservoir is omitted from Exhibit 51 it does not signify that Mr. Duvall did not see reservoir. I do not know whether he did any work on it.

Actual cost of construction is the true gauge and not mere estimates by engineers. Estimates have nothing to do with real cost, as we found out. So far as actual cost of construction is concerned, estimate might just as well be fixed at one cent. Management is generally cause of extra cost and that is one reason estimate of 2030 engineer does not get closer to true cost. At any rate, statement of Harry L. Monroe that estimated cost would be \$375,000 was not signed by me and never would have been.

Carrying capacity of Sky Line Ditch is 130 cubic feet per second.

Recross-examination by Mr. N. E. Cortbell:

2030 The Upper Rawah Ditch was constructed to carry 200 second feet of water, but I do not remember the dimensions or grade. The capacity was never ascertained from measuring the act-

ual flow of water in it, but by measurements of its cross section and grade.

- 2031 The 17,000 acre tract in the neighborhood of the Pleasant Valley Canal and the tract in the Loudon Ditch country which we thought of using our water upon, are both on the south side of the Poudre River, and aside from these two tracts, our plan was to turn the water into the Poudre River, knowing that the demand would come, from whatever source could not be foretold. It
- 2032 was this general demand for a supplemental supply and for the irrigation of new land that we had in mind, excepting as to the amount we might use ourselves. The water could
- 2033 be used any place in the valley, and as the highest ditches were the Poudre Valley Ditch on the north side and the
- 2034 High Line Ditch on the south side through which water could best be carried to new lands, our idea was to connect it up with either of these. In 1905 the negotiations for the Poudre Valley Ditch were begun, and were consummated after I left the project.

Redirect examination by Mr. Charles F. Tew:

- 2034 Negotiations with different carriers and selection of exact line of canal to reach new land for water was not under my personal supervision or control. That matter was left with Mr. Akin because of his greater familiarity with conditions in
- 2035 Poudre Valley. He had lived and farmed in that section. He was more familiar than I with areas needing water. Then too, the proposition was entirely too large for any one person to think of doing. If they were going to handle the irrigation end in the Poudre Valley, my part was to develop the mountain system. I am not so familiar as the rest of them were with the plains end of it.
- High value of land in Poudre Valley and great benefit obtained compared with use on land in Laramie Valley brought me to study problem of bringing water from Laramie Valley. I knew that it was possible to bring large amount of water to Poudre Valley where it could be used to greater benefit. In this proposition I was given charge of scheme and method of accumulation and carriage of water to be diverted from Laramie River to Poudre River. My opinion generally prevailed on that topic.
- I was generally acquainted with economy in operation of ditches and high state of development and matters of exchange indulged in in Poudre Valley. Also had general acquaintance with
- 2036 location and use of reservoirs. Also knew that water obtained late in growing season was of higher value.

I knew generally there was not sufficient market for all the water I could bring from Laramie River if used exclusively for supplemental supply to lands already irrigated. As a matter of precaution we made provision for an area upon which to place this water we might obtain. While we might rent some of the water, our object in making these surveys along the line of Poudre Valley Canal was to make provision for use of water later to be obtained from Laramie

Valley. Being on independent footing we could thus deal with the entire situation. The system, to be feasible, required collection system upon the Laramie and distribution system in Poudre Valley.

I was in charge principally of construction and arrangements of plans for collection end on Laramie river, and Mr. Akin and his associate in planning, laying out, establishing and building distributing lines on the plains.

2038 Mr. A. I. AKIN, Fort Collins, Colorado.

Direct examination by Mr. Delph E. Carpenter:

Abraham I. Akin, Fort Collins, Colorado. Lived there since spring 1880. Farming during those years.

Am same Abraham I. Akin early identified with project of Greeley-Poudre Irrigation District on the Laramie River. Am same Mr. Akin who was identified with Wallace A. Link who has just testified. My brother, Myron Akin, was later identified with project.

This project first called to my attention in spring of 1902 by Wallace A. Link. Made first investigation trip to Laramie River in Colorado in July, 1902, with Wallace A. Link. Went up there with him to look up prospect of bringing water into Cache  
2039 la Poudre River. We took teams from Ft. Collins and went up Laramie River and from there packed up to what is known as Link Lakes, and were gone about 6 or 7 days.

August, 1902, I took an engineer from Fort Collins. Met Mr. Link at Chambers Lake and we went down Laramie and packed up to Link Lakes and ran survey line from upper lakes across to West Fork of Laramie River. Frank Beach was engineer who ran that line. He began his survey August 25, 1902, that was day he actually began on ground. There were three of us in surveying party. We were engaged in this survey about 15 days. During that time we surveyed line of Upper Rawah Ditch to connect with that what is known as Link Lake No. 4, situated on Rawah Creek. A snow storm interrupted our labors. We also ran out of food.

2040 Snow was too deep to do any more work that fall.

Mr. Beach made plats of survey made by us and we filed that, Mr. Link and I, with State Engineer.

(Defendants' Exhibit 74 offered in evidence.)

Defendants' Exhibit 74 is a copy of map prepared by Mr. Beach. I have also checked over statement of claim attached to map and think it is correct copy of claim prepared by us. Am familiar with line of Upper Rawah Ditch as now constructed. The present line is nearly same as location shown on this map. The variation begins at Rapid Creek near Grassy Pass. The ditch from Grassy Pass to Laramie River is now constructed. There was quite a departure from the original line above Rapid Creek to avoid heavy cut through Grassy Pass. By making a drop just above Rapid Creek, ditch could be run around on grade and strike river on little better

2041 ground. It made no substantial difference in ditch other than mere convenience in construction.

Exhibit indicated that we began work on August 25, 1902.

Statement of claim indicates carrying capacity of ditch to be 224 cubic feet per second. That was size of ditch contemplated by us at the time. On exhibit the ditch and reservoirs are termed Link Lake Ditch and feeders and Link reservoir. That was afterwards changed to Upper Rawah Ditch.

About \$350 was expended by Mr. Link and me in making this survey. Each party bore one-half of the expense.

2042 I last saw the Greeley-Poudre Irrigation District System of works on Laramie River in September, 1913. System now in process of construction is same system early conceived by Mr. Link and me. The ditch indicated on Defendants' Exhibit 74 is a part of the Greeley-Poudre System.

In July 1902 in addition to inspecting the land occupied by Upper Rawah Ditch, we looked over general lay of country all up and down Laramie River and also the tunnel site. We checked over the ground in a general way for the entire system. The only surveying done in 1902 is shown on Defendants' Exhibit 74. We had no other data from which to prepare further maps.

In spring of 1903 Mr. Link went up with man and started construction of road from state road up to Link Lakes. He worked for a while and then came back and went back again and stayed 2043 all summer. He stopped work for a while, owing to snow being too deep after he got to mountain side up toward lake.

Road work was done so we could get supplies up to Link Lake Ditch. Work on that system could not have been carried on without that road. It had to be built. No one other than Mr. Link and I was in any way interested in the construction of this road and it was not constructed for any other purpose than to aid construction on this enterprise. Since constructing the road the Forest Reserve has been created and the road is now used by employees of the service. I assisted in construction of road and also took supplies up to Mr. Link.

In 1903 I tried to interest some of ditch companies down there with us in development of this project and took Mr. A. H. Rice up to look it over and also conferred with directors of Poudre Valley Reservoir Company, the owner of the Poudre Valley Ditch that has been referred to in other testimony in this case. That canal is a part of the present system. I took matter up with the board of directors of the company in 1903 in August. Object was to get them to run water through that canal out to plains. These plains 2044 are same territory now constituting Greeley-Poudre Irrigation District. Poudre Valley Canal was then partially constructed. They have been working on it since that time.

Continued to be associated with this enterprise to present time. Further efforts were made after 1903 toward absorbing Poudre Valley Canal as part of this system. Mr. Hibbard and my brother Myron were working with Poudre Valley people at same time. They made some kind of agreement to run water through the canal. They

had some stock in the canal company. Various negotiations were carried on with company.

2045 They went over the work of the system with us later, in the fall of 1906. Negotiations terminated in purchase of Poudre Valley Ditch by the Laramie-Poudre people.

Myron Akin, my brother, became interested with Mr. Link and me in the spring or early winter of 1904. Mr. Harris was partner of Myron Akin in real estate business and he came in at same time. Mr. Hibbard came in a little later.

All of Mr. Hibbard's time was devoted to promotion of this enterprise. He continued in service until killed, March 25, 1910, in automobile wreck on way to tunnel when they were constructing the tunnel.

2046 In 1904 we had surveying party in field on Laramie River from early in spring until October. R. Q. Tenney was first engineer who went that year. Mr. Zac Duvall went up later and stayed until October. Mr. Tenney began his survey March 12, 1904, on tunnel.

(Defendants' Exhibit 75 offered in evidence.)

Defendants' Exhibit 75 is copy of map of East Fork Reservoir ditch from West Fork to East Fork of Laramie River and tunnel line from Laramie to Poudre River. It was mapped by R. Q. Tenney as engineer. That is a map, or copy of a map, prepared and filed subsequent to the Tenney survey of ditch I have spoken.

May, 1904, Mr. Duvall went to work. Have heard Mr. Duvall's testimony. He covered the situation very fully. I can and do corroborate what he said in that regard.

In 1904 construction work was carried on on Upper Rawah Ditch. First work done in 1904 was in construction of ditch from West Fork to East Fork of Laramie River and to tunnel. During period of construction of 1904 I was there nearly all the time, back

2047 and forth from Fort Collins. Have heard testimony of Mr. Duvall and Mr. Link concerning the construction work going on in 1904. They stated the facts in that regard.

About \$20,000 was placed in this enterprise at the conclusion of work in 1904. No construction work was going on that year on plains distribution end of system. Negotiations were continued all the time under supervision of Mr. Hibbard and my brother, Myron H. Akin. I was not identified to any degree with these negotiations. I was with surveying gang out on work, running lines and other work on Laramie River and looking after things up there.

2048 August, 1904, Mr. Link started excavation on Upper Rawah Ditch line at lower end. Ianson and Walthall started work August 10. I have photographs of the work completed during the season of 1904 on Upper Rawah Ditch.

(Defendants' Exhibit 76 offered in evidence.)

Defendants' Exhibit 76 is picture taken about 1,000 feet above lower end of ditch of Upper Rawah Ditch, where it drops into West Fork of Laramie River, around the rock point. Ditch line was



constructed around rather than through point. I took picture late in 1904. It shows conditions as they existed in that year. I have photographs which, though taken at later date, show conditions at close of work in 1904.

(Defendants' Exhibits 77 and 78 offered in evidence.)

Defendants' Exhibit 77 is photograph of end of ditch where it drops into West Fork of Laramie River, where Link started to cut in 1904, showing water coming out of end of ditch. Shows conditions as they existed in 1904. Defendants' Exhibit 78 is 2049 ditch line where Isanon and Walthall did their work, just above Fall Creek and below Rapid Creek. It was taken subsequent to 1904 but shows conditions that then existed. Shows ditch lines and way it was constructed.

Was with surveying party of Zac Duvall during most of season of 1904. Have seen Defendants' Exhibit 51, known as Duvall's map. It shows Upper Rawah Ditch and two gathering ditches, the East Side Ditch and West Side Ditch, two pipe lines and the tunnel line. Mr. Duvall did no engineering work on other units or parts of this system than those shown on the map, Exhibit 51. Only difference between Duvall survey and present West Side Collection Ditch, is that it is carried on side of mountain to tunnel instead of crossing river with pipe line as designed by Mr. Duvall.

Mr. R. Q. Tenney did no surveying as chief engineer other than that indicated on Defendants' Exhibit 75, known as the Tenney Map. He was with Mr. Duvall for a short time on Upper Rawah Ditch. Diversion system portrayed on three maps, Exhibits 51 (Duvall Map), 74 (Beach Map) and 75 (Tenney Map) is practically the same system first conceived by Mr. Link and me in our expedition in 1902. Beach survey was preliminary. Tenney survey was also preliminary. Duvall survey was definite location.

Mr. Duvall was engineer in charge of work of excavation as well as definite location of lines. He was kept busy all the time until Ianson came out in fall.

2051 Harry L. Monroe came into the associations of individuals interested in the project in summer of 1904, just before we started work on Upper Rawah Ditch. He advanced money in connection with starting the work. Later severed his connection with the firm.

In 1905 and 1906 efforts of myself and associates were directed principally towards the distribution end of the system, on Poudre River side. To taking water through Poudre Valley Ditch out to plains east of Nunn and Pierce. Charles R. Hedke was engineer for association of individuals during that period. I have heard his testimony given in this case. He described correctly the work done by him or under his supervision during those years.

The Laramie Reservoirs and Irrigation Company was formed September 19, 1906. It succeeded the association of individuals. Up to September 19, 1906, Mr. Hibbard, my brother and I and part of the time Mr. Harris and Mr. Monroe constituted the owners of

this system. The Laramie Reservoirs and Irrigation Company succeeded to all the rights to water, construction work, camp supplies, and all other property, including filings on Laramie River and interest in the Poudre Valley Ditch on the Poudre, theretofore belonging to individuals.

The Laramie-Poudre Reservoirs and Irrigation Company succeeded the Laramie Reservoirs and Irrigation Company. March 19, 1907, the Laramie-Poudre Reservoirs and Irrigation Company was organized. They succeeded to all the rights, titles and property theretofore owned by the Laramie Reservoirs and Irrigation Company.

A contract to run water through the Poudre Valley Canal was the result of the negotiations carried on with The Poudre Valley Reservoir Company during years 1905 and 1906. Water to be carried for use on land from ditch extending east from end of present Poudre Valley Canal.

2053 During 1905 and 1906 the association of individuals and the Laramie Reservoirs and Irrigation Company expended considerable money to further the enterprise. Up to October 1906, \$31,736.90 had been expended by the association of individuals and the company on this enterprise. We had also expended \$4,998.00 in purchase of property on Laramie River.

At the beginning of work in 1907 (March 1), my associates and I had expended on the system, outside of purchase of properties on Laramie River, \$34,045.01. In both ranches and work we had expended \$46,079.32. During 1905 and 1906 my associates and I had borrowed money on the property to do the work. Mr. Hibbard and my brother had been working nearly all the time to interest capital to help build the system. They spent considerable money in putting forth these efforts. That money was expended entirely in connection with the system.

2054 In 1907 in mountain division we let contract with Ianson for use of his teams and equipment at so much per team, we to furnish all supplies. We furnished the men and Ianson was to be foreman of the outfit and took charge. We also made contract with some Greeks that just came from construction work on Moffat Road, to go up and do part of work on Upper Rawah Ditch. We also made contract with Hokosana, a Jap, to do part of the hand work or pick and shovel work on that ditch where we could not use teams. We proceeded to excavation work along line of these contracts.

Work was carried on during season of 1907 from July 1 to October 1, when snow storms started in and we had to come out. I have photographs representing conditions along line of Upper Rawah or Link Lake Ditch at beginning of work in 1907.

(Defendants' Exhibits 79 and 80 offered in evidence.)

Defendants' Exhibit 79 is photo of ditch line above Fall Creek on divide between Fall and Rapid Creeks, showing bottom of ditch where we shoveled it out to get teams through to Rapid Creek in early part of July, 1907. Mr. Burgess Coy, engineer in charge of work, is standing in ditch and snow shows on both sides. We had to shovel road up to get Japs' camp there on Rapid Creek where they

had to do their work. Mr. Coy was working under Charles R. Hedke as chief engineer of the whole system.

Defendants' Exhibit 80 is photo taken a little further north of photo shown in Exhibit 79 and on slope going down toward Rapid Creek in timber on road which Mr. Link and I constructed across that country in 1903 and 1904. Photo shows bunch of Greeks that we took up there, shoveling snow out of road. Photo taken July, 1907.

Various parties with whom we contracted proceeded to carry out their work in 1907. Hokosana sent up his crews of men. Had about 100 Japs working there all summer. They did pick and shovel work. Their contract was from Rapid Creek south. I took photographs of these Japanese laborers while they were at work that season.

2056 (Defendants' Exhibits 81, 82 and 83 offered in evidence.)

Defendants' Exhibit 81 is picture of Mr. Ianson, foreman of the work that was being done on Upper Rawah Ditch in 1907. He was under Mr. Coy as engineer and Charles R. Hedke as chief engineer. Mr. Coy is in center of picture and foreman of Jap gang is sitting on left of picture and Mr. Ianson is at left of Mr. Coy. Taken just south and west of Rapid Creek along ditchline of Upper Rawah Ditch.

Defendants' Exhibit 82 is photo showing Japs at work on ditch line. It was taken by me in 1907.

Defendants' Exhibit 83 is photo showing portion of Upper Rawah Ditch where it comes around Rocky Point above Rapid Creek and to the south of the creek. This work was done by Japs. Photo is taken very near the south portion of their contract work. They scattered out over whole contract in little bunches. The bank was very high and in many places they had to shovel the dirt twice to get it over the bank. They had a platform up on side of bank and one man would throw dirt up onto platform and another man would throw it over the bank with shovel.

2057 The Greeks did heavy rock work where heavy bowlders were in ditch. They were better rock workers than the Japs. We put them wherever we had difficult work with rocks. The Greeks did not succeed in their contract and we put foreman over them under Ianson and did the work during the latter part of season by force account ourselves. We employed the same Greeks. I took photos of these Greeks at work during 1907.

(Defendants' Exhibit 84 offered in evidence.)

Defendants' Exhibit 84 is picture of some of Greeks working on ditch bank, there is heavy bowlder deposit at this point. They are throwing dirt up on bench and over bank. Location just north of where Fall Creek crosses line of Upper Rawah Ditch.

We got excavation along line of Upper Rawah Ditch entirely completed to point above Rapid Creek. Then there are portions above Rapid Creek and towards Camp Lake where the work is

finished. Right of way is cleared of timber to Camp Lake.  
2058 Capacity of ditch as completed from Rapid Creek to West Fork of Laramie River is 224 cubic feet of water per second of time. The ditch intersects various branches of Rapid and Fall Creeks.

Work was done on this ditch subsequent to 1907. The ditch was broken in a few places and in 1908 I sent some men up there to fix up those breaks. We ran all the water that came down that summer and the ditch was again broken in two or three places and during this year, 1913, I took a man and went up there and fixed those breaks in July and August. I had charge of the men that did the work that Mr. Hedke testified about. They looked after the ditch while they were up there, and worked on the ranches, and built roads on the Laramie River the rest of the time.

Plans for constructing the remainder of this Upper Rawah Ditch, adopted subsequent to 1907 were that after 1908 they started construction work on the tunnel and the two collection ditches in the valley, the one from Deadman and the one from Rawah, and it was decided that we could do the remainder of the construction  
2059 work on the Upper Rawah Ditch cheaper with maintenance crews than we could by putting gangs up there and keeping them there. After we could get the rest of the system running, we could put our maintenance men up there and have them there in case there was any break in any of the ditches, and at the same time keep them working at construction work on the Upper Rawah Ditch, back to McIntyre Creek.

There never was any intention of abandoning the Upper Rawah Ditch. That ditch is an essential and necessary unit of the system. It has been carrying water and discharging into the West Fork of the Laramie River since 1904.

In summer of 1907 final location of Laramie-Poudre Canal to Crow Creek was finished. While we were working in the mountains with the Japs, the Greeks, and also the gang of white men, Mr. Hibbard and Mr. Ziegler, acting for the company, purchased two under-slung Avery engines and graders and started those at work west of Wellington and east of the end of the Poudre Valley Ditch. They worked those engines until October on that piece of work, and then Mr. Ianson came down with his crew of men from Upper Rawah Ditch and they put him to work on the fill above No. 2 Reservoir of the North Poudre people west of Wellington. They took the Greek crew which we had in the mountain, when they came down, and used them till after Christmas putting in the siphon across Box Elder Creek above Wellington and a siphon under ditch line where North Poudre Laterals cross the ditch near  
2060 Wellington. This was crew of 50 men. Had about 50 men engaged on Upper Rawah Ditch outside of Greeks and Japs during 1907. We had on that work during that summer, 50 Greeks, 50 Whites and 75 to 100 Japs. The hardest task we had was keeping men up on the mountain construction work in 1907. It rained a great deal of the time and in many places the work was wet. It was very hard to keep mule drivers up there. Part of Mr. Ianson's

horses were idle on that account. That however is the usual experience in that country. It is especially so after the September or early snows commence to come and when the threshing and best work commence down in the valley. The men break away up there and come down and work on farms.

2061 In 1907 Ianson, after coming out from the mountain work, took charge of the engine crews with grading teams and moved north and east of Wellington. They were put to work there on the ditch where the cut was not over  $4\frac{1}{2}$  feet and worked there until Christmas time. The company had let two contracts, for two cuts in ditch. They took engine crews after they got through with north mile near Wellington, and moved them 3 miles east of Wellington on another little grade through there and worked there until along in January and then moved them out into Coal Bank Draw Country. Coal Bank Draw is 12 miles east of Fort Collins.

During 1907 and 1908 other construction contractors were excavating earth along line of Greeley-Poudre Canal. Mr. Lemonds of Nunn, Colorado, had a crew working west of that place, and about 5 miles due west of Pierce. In 1907 Mr. Harry Knowlton finally took contract to build the whole ditch system out to McGrew Reservoir, and in that contract he took over the engines and graders and all camp equipment that the company owned, and took charge of the work and kept going part of the summer of 1908. Think he stopped in June, 1908. Continued to do some little work after that. He kept his contract alive with small gangs. We ran out of money about that time.

Knowlton ceased work at just about the same time that the Greeley-Poudre Irrigation District was formed.

There may have been other contractors in 1907 and 1908 other than those I have mentioned.

Ben A. Johnson of Golden, Colorado, was superintendent in charge of this work on the plains division of Greeley-Poudre system during the construction in 1907. In March, 1907, the company took over the McGrew Reservoir and about 6 miles of its inlet ditch had been completed and incorporated it as a part of the

2063 Greeley Poudre Canal. The reservoir had been constructed with a 25 foot cut and an outlet tube and gate constructed and the cut was filled up where it had been excavated at the gates until it would hold 25 feet of water in depth. The inlet canal was completed back to Eastman Creek. This creek is designated on Defendants' Exhibit No. 1 as east of Union Pacific Railroad in Greeley-Poudre Irrigation District.

These contractors I have mentioned were strung out along the line between the lower end of the Poudre Valley Canal and the McGrew Reservoir during 1907 and 1908. This new ditch constitutes an extension of the Poudre Valley Canal. Mr. Johnson had had charge of construction of Eastman Reservoir and Inlet Canal prior to 1907. He is a civil engineer.

In 1907 Mitchell Lakes Group of reservoirs situated on North and South Pine Creeks were acquired. They were absorbed into the

Greeley-Poudre system. Had been previously owned by Bond Brothers of Trinidad, Myron H. Akin and Jesse Harris. They afford some small water supply for the district.

2064 I should judge about \$250,000 was expended in excavation work, enlarging equipment and supervision in 1907. Our work from 1904 to and including 1908 was open and notorious, and open to observation of people in both Colorado and Wyoming.

People in the Laramie River Valley knew of the work in 1904 to 1908. We bought supplies, butters, eggs and other like commodities up and down the river. We were freighting from Fort Collins all the time. People were coming and going from Laramie City at the time we were surveying in the valley and we had parties visiting at the camps there off and on and watching the working. We bought all of our meat supplies on Laramie River.

In 1907 the financial panic temporarily tied everything up. As the result of the panic we had to issue script owing to the fact we were running out of money. We had made arrangements

2065 for more money. The panic caused these parties to fail to keep their contract and furnish us money. The script we issued was a promise to pay, drawing interest at 8 per cent due in six months. We paid the men half in cash and the balance in script. This we did until February, 1908. Then we took the six months' part of the script off and gave them the script straight and paid them half cash until we had to stop work. In 1907 we paid the men who were working on the Upper Rawah Ditch every 15 days in money. The paymaster had to carry the cash. The Greeks would not take checks. The white men under Ianson were paid by checks once a month. The Japs were paid through their contractor Hokosana each month at the office in Fort Collins and he paid his men. I carried the money every 15 days from Fort Collins to the Upper Rawah Ditch for payment of Greeks. We brought the payrolls down, put money in an envelope that belonged to each Greek and went up there and gave him his envelope, made him sign up the payroll and brought it back to Fort Collins and turned it in at the office. During all the time subsequent to 1903 and up to and including 1908 and 1909 there had been a permanent, well-established office of the co-partnership or associated people first and later of the two companies, kept at Fort Collins, with secretary and president there all the time. That office and its

2066 employes had been constantly engaged in financing and clerical work of the system. We also had an office for chief engineer and his crew of men. The engineering crew was engaged in office as well as field work during that time. I carried the work from the field to the office men to work up once a week to work through all along the time.

The other surveys mentioned by witnesses, for example, a line of canals on south side of Cache la Poudre River near Pleasant Valley Canal; survey of ditch from Glendevey around by Sand Creek in Wyoming, and a number of other smaller surveys, were all made to demonstrate that the tunnel was a feasible and the only way of diverting the water from the Laramie River and to demonstrate



and show investors that we had the only feasible way of diverting the water and also of distributing it to the land east of the Poudre Valley Ditch and Fort Collins and that there was use for the water we could divert from Laramie River. They were all of them collateral surveys. They were all made for the common good of the enterprise.

2067 In 1907 and '8, prior to excavation during that year, contracts were entered into with land owners for purchase of water rights in territory now embraced in Greeley-Poudre Irrigation District. These were obtained by Mr. Hibbard. The same lands covered by contracts for water right in 1907 were later merged and incorporated into and made a part of the Greeley-Poudre Irrigation District. The district method and the contract method were merely different means of obtaining the same end. The obtaining of these contracts entailed considerable labor. This was going on as early as 1905 and 1906. Some money was obtained by means of these contracts.

From May, 1903, and thereafter, we intended to put the water to be obtained from the Laramie River on the territory now embraced in Greeley-Poudre Irrigation District, through the Poudre Valley Ditch.

During the years I have lived in the Cache la Poudre Valley I have had occasion to observe the construction of canals both in the mountains and in the valley. Mountain work is much more difficult than plains work. It takes two-thirds more time to build a ditch in the mountains than it does in the valley. It is more expensive. The mountain working season is a great deal shorter than in the valley. In the valley you can work practically the year around.

2068 The Greeley-Poudre Irrigation District was organized April 3, 1909.

Cross-examination by Mr. N. E. Corthell:

2068 The Poudre Valley Ditch was built in 1902-3, and after its construction, about the summer of 1903, we began negotiating

2069 with the owners for a right to run water through it. This ditch diverts water from the main Poudre River and intercepts the tributaries entering from the north. It will carry water from the Mitchell Lakes. In 1909 an extension of the Poudre Valley Ditch as far as Nunn was constructed by the Laramie Poudre Company, but it is not yet completed, and no water has been run through the extension. The Pierce Lateral, crossing the Union Pacific Railroad near Pierce, is not an extension of the Poudre Valley Ditch, but of the Larimer County Ditch, belonging to the Water Supply and Storage Company, and it receives no water from the Poudre Valley Ditch or its extension. The ditch which was completed and turned over to the Laramie-Poudre Company early in 1907 was part of the ditch designated as the Poudre Canal on Exhibit No. 1, beginning at Eastman Creek and running into the McGrew Lake Reservoir,

enabling the storage of water in that reservoir from Eastman Creek.

2070 The memoranda which I have showing the amount of expenditures upon this system up to 1907 were given me by the secretary, Mr. Hibbard, and cover the entire amount expended by our partnership and the succeeding companies for all purposes in connection with the enterprise. Apart from this statement, I have no knowledge of the matter. As I recall, the amount paid Ianson and Walthall for work on the Upper Rawah Ditch in 1904 was between \$3700 and \$3800, this not including the work that

2071 Mr. Link performed. These contractors had a contract for two and one half miles on the lower end of the Upper Rawah Ditch, but they did not do all the work. They distributed the work over the whole distance, and we completed the work with Japs and Greeks in 1907. Mr. Link worked a gang of men in 1904, clearing the right-of-way through  $2\frac{1}{2}$  or 3 miles of timber and excavating along the ditch line both before and after the contractors did their work. The gang he worked of about thirty men was changed back and forth from clearing to excavation from August to October, but I cannot say how much work was done upon excavation by that gang. Sometimes he had as many as fifty men, and I believe never less than twenty-five, there being on an average about thirty or thirty-five working for two months or two months and a half. Part of the time he had four teams upon this work.

2072 There was no construction work done in that country in 1905 nor in 1906, and I cannot give any approximate statement of the amount expended upon work in the Laramie Valley in 1907. In 1908 there were four men employed in the Valley repairing the ditch, these men going up there in June and staying until after the tunnel was commenced in December, 1909. These men

2073 looked after the ranches on the river, cared for the road up the river, kept the ditch in repair, and after December, 1909, commenced clearing the right of way for the diversion ditches on the Laramie River. Until December, 1909, these men did no construction work, and we paid them forty dollars a month and board apiece.

The picture marked Exhibit 76 was taken some time in 1904. No. 77 was taken by Mr. Stuart July 9, 1912; No. 78 by Mr. Stuart July 9, 1912; No. 79 by myself, July, 1907; No. 80 by myself, July 1907; No. 81 by myself July, 1907; No. 82 by myself, August, 2074 1907; No. 83 August, 1907, and No. 84 August, 1907.

The ranches our Company purchased in the Laramie Valley are located below the tunnel on the river and on the McIntyre, and lie some miles below the point where our system begins to collect water. They are irrigated ranches, and were purchased for use as supply ranches to furnish hay and grain.

The Greeks we used in the summer of 1907 had been working during the previous winter upon the Moffat Road which was in process of construction across the Continental Divide south of our project.

2075 We repaired breaks on the Upper Rawah Ditch about the first of August, 1913; we were up there doing surveying work at that time.

WALLACE A. LINK, recalled.

Direct examination by Mr. Charles F. Tew:

2076 I have had experience in construction of ditches on plains of similar size to those now being completed by Greeley-Poudre Irrigation District in Laramie River Valley. In mountains we have to transport our men and provisions for long distances over mountain roads. We have to clear the timber where we intend to work. There is always a great amount of rock work on the surface where the ditch is to be constructed and after this rock is moved the stumps of trees have to be taken off by blasting, and after this is done then the right of way has to be cross-sectioned and then construction in form of excavation begins. After cross-sectioning we have to remove all perishable material from the ground on the lower side of the ditch to fix a place for the bank so as to make a water tight joint. This entails considerable work in the mountain regions, because the pine needles and roots of trees running through. None of these things have to be contended with on the plains.

On plains work we always are close to town, have roads to transport our commissary stuff on, tools, provisions, and everything of that kind handy. Men are easy to get. Mountain work always necessitates return of men to town at the close of the season's work. On plains there is no preliminary preparation to be made except the establishing of camp and proceeding with actual excavation of ditch. There is no timber or rock to be moved, no clearing of base line of ditch from perishable material and such work.

From 90 to 120 days is the limit of the mountain working season, depending upon the snow fall in the fall of the year or the lateness or earliness of the spring. It is possible to work throughout the entire year on the plains, barring some exceptional seasons.

2078 Expense of removing earth varies in the two places. On Sky Line Ditch they paid about 50 to 75 cents per cubic yard for loose material and \$1.50 for solid rock. On our work we paid 35 cents for loose material and \$1.10 for solid rock. No rock measuring less than a yard would be considered solid rock. On the plains earth and loose material is excavated from 12 to 14 cents per cubic yard and sometimes less than that. Have heard of it being moved for 10 cents per cubic yard. Rock work usually costs from 50 to 75 cents.

2079 JOHN R. WORTHAM, recalled.

Direct examination by Mr. Delph E. Carpenter:

(Defendants' Exhibit 85 offered in evidence.)

Defendants' Exhibit 85 is photograph taken by Victor G. H. Stuart, Spring, 1912. Scene is Laramie Valley as it appears when looking towards tunnel from south point of Middle Mountain, showing east and west side mountain ditches, road along side of Middle Mountain and point where tunnel penetrates Green Mountains. It correctly represents locality of system. Dark line of mountain side on right of picture shows line of that portion of West Side Collection Ditch, which has been constructed and so appears on picture. East Side Collection Ditch shows, although not very clearly, on mountain side on left hand side of picture and is marked with arrow pointing to line. Tunnel location is shown by arrow near center of picture and wagon road is shown by another arrow on left hand side of picture with vertical lines at point on road. You are looking up stream of Laramie River in picture. Looking toward head waters of East Fork of Laramie. The collection ditches run up the river towards the tunnel and away from you as you look at the picture. I have placed arrows on picture indicating locations.

2080 Upper Rawah Collection Ditch or Link Lake Ditch does not show in picture. It is back of mountain shown on right hand side of picture. It is at much greater elevation than even the top of mountain shown in picture. I have indicated tunnel location on east side of river. You cannot actually see tunnel portal in picture.

Direct examination by Mr. Charles F. Tew:

2081 On Exhibit attached to answer of corporate defendants I indicate in red color three reservoir sites in bed and channel of river—Cache la Poudre River. But one of these, the Elk Horn, is contemplated for construction.

I have previously stated that all water obtainable from all sources of supply interceptible by works of Greeley-Poudre Irrigation District system are and will be needed for annual irrigation of lands of district. I will explain my reason in following manner:

To be practicable an irrigation project requires three essentials:

First, irrigable lands under climatic conditions suitable for agricultural purposes;

Second, an available sufficient water supply, obtainable within feasible cost of construction and operation;

Third, a system of ditches, reservoirs and works ample for diversion, storage and distribution of water supply necessary for the annual service of reclaimed area.

2082 With all these elements present the project is a success; with any absent the venture is a failure.

The problem of securing ample water supply for a given surface and serving the same in cropping season is as variant and non-uniform as topographies, stream flows and climatic conditions. For

this solution there is required ascertainment of quantity of water annually necessary and character and capacity of works required, properly to distribute the same in sufficient amount and at proper time within cropping season.

There must also be considered the volume of water flow of the streams and supply sources intercepted, the character and fluctuations of this flow, the remoteness in construction and operation, the distance of carriage from diversion to application and attendant loss in transportation and storage, as well as the duty of the intercepted stream to prior appropriation.

In irrigation development the easy constructions are the first indulged and as the area extends expense increases with the attendant necessities of long carriage, reservoir storage and economic use.

In localities where development has reached a high stage and the easy constructions have been accomplished, there often remain large areas remote from the supply of streams, which, with proper systems of canals and reservoirs are feasible of reclamation and may be made highly productive agricultural sections by inclusion into one enterprise of sufficient magnitude that the works may be installed at a feasible cost per acre which may be sustained with profit, provided ample water supply is obtained.

2083 The necessities of such an undertaking are: an area sufficiently large to sustain the construction costs and operation expense, as no single acre can bear this burden, and to provide a system of works and adequacy of supply for the entirety.

On this class of enterprise the whole must succeed or fail together. The total area is necessary to sustain the cost; the total supply required to answer the irrigation demand.

The Greeley-Poudre Irrigation District system is an instance of this class. Here is present the first essential of a successful project, in the existence of 125,000 acres, irrigable and arable at elevation and under climatic conditions suitable for successful tillage.

There remains to render the project feasible the adequacy of works and sufficiency of water supply. While as to the amount required, unanimity of opinion among experts and agriculturalists is not obtainable, nor to be expected, it is safe to say that this area will need at least, and may be properly irrigated by the annual application of 125,000 acre feet of water delivered upon the land. To meet distribution losses an aggregate diversion in excess of this amount must be obtained.

This quantity of water, in view of prior appropriations from the Cache la Poudre and its tributaries is not annually obtainable from that stream, nor is there obtainable in view of its present duty, more than half this amount. The flow obtainable from the Cache la Poudre can be secured only by means of a channel reservoir and the large intake to the district works, so as to impound and divert from the stream the only unappropriated flow annually passing; which is that portion of the freshet discharge in excess of the aggregate carrying capacities of the many direct ditches and reservoir intakes now in operation in the irrigation of the large area already served in this highly developed agricultural valley.

The remaining portion of this district supply, approximately one-half, is obtainable from no source other than the waters of the Laramie River in Colorado by means of the ditches, tunnels and works of the Greeley-Poudre Irrigation District.

With the waters obtainable from the Poudre and its tributaries and the Laramie and its tributaries in Colorado, these Colorado lands may be reclaimed and this project made successful. The loss of either supply or of part thereof must result in its destruction.

The whole area, the whole supply, the whole system of works must be held and operated together as designed and in course of construction, and all the water from every available source must be annually diverted whenever possible, stored when taken out of irrigation season, and economically distributed to accomplish the desired end.

To water this entire area within feasible cost per acre, it is necessary to have works and water supply for the whole area and not a part of it. In order to secure sufficient supply for this whole area, it is necessary that all possible water be obtained from Poudre flow and also from the Laramie flow. There is considerable  
2085 difference in the character of these two flows. The Poudre is not thoroughly dependable owing to fact that it has some excessive floods. No part of the area could depend for service upon the unappropriated flow of the Poudre. There is a dependable and steady flow of water which can be obtained from Laramie River by our system of works and can be combined with flow of Poudre. There can also be obtained, from various arroyas, a small flow from flood waters intercepted by system, but this is of no particular consequence. This latter flow is only good for supplemental supply.

In order to deliver water required for annual irrigation of the area of this district, it is necessary to practice economy in storage, carriage and distribution. The system of works of district is both storage and direct diversion in character. It is quite similar to the system of The Water Supply & Storage Company in Cache la  
Poudre Valley. The Larimer and Weld Irrigating Company  
2086 also has mountain works to some extent and also the North Poudre system.

It will be necessary to exchange but a very small portion of the water of the district in making diversion and delivery. Douglas Reservoir is the only reservoir requiring exchange.

Water reappearing within the district from waste, seepage or irrigation above will be re-captured and stored in the March and Camfield Reservoirs indicated on Exhibit 1.

District works are so designed that certain portions of the lands may be served in part by return waters appearing within district. This water will not appear at first application of water but within few years subsequent. It is planned to intercept this character of water whenever it appears. Experience has demonstrated that the quantity of return water is always variant but it is cer-  
2087 tain to appear in some quantity. The area included within the district is larger than any of the other areas now served by canals in Cache la Poudre Valley. It will require all of the



water obtained from all of the sources contemplated by the system of district works in order to reclaim this area.

Late development in the Poudre Valley resulted largely from reservoir construction. These have been employed in connection with exchange systems so as to accomplish the greatest possible service of area.

The construction of reservoir system of Cache la Poudre Valley began in the main, sometime in the early '90's after the normal stream flow had been largely appropriated and as the value and utility of late water for July and August, (when the flow is low) began to be more apparent. These reservoirs were constructed to supplement the supplies of ditches then already in operation.

Reservoirs are in general built in natural depressions remote from the channel of stream, across the low line of the rim of which are established the dams wherein outlet devices are installed. These basins are filled by inlet ditches carrying water in non-irrigation time and in irrigation season when the stream flow during freshet or sudden rise is sufficiently abundant to afford flow for all direct ditches and, in addition, an excess for storage.

2088 Impound of the reservoirs is held until sometime in the middle of or late July and August when the most valuable crops are in greatest need and river flow is lowest. At this time reservoir water is employed to supplement the stream and

2088 in this manner the area served is greatly extended and crop results are much increased.

Necessity caused reservoir construction.

Only in recent years has there been commenced the construction of stream-bed reservoirs which, though expensive, are the most efficient. This class of reservoirs are of especial utility under conditions such as those now prevailing in the Cache la Poudre Valley, where all the normal summer and all the winter flow is appropriated by direct ditches and by reservoirs, leaving only in times of freshet an available supply above the present duty of the stream. This is the only flow obtainable. This flow is often of too short duration to obtain through inlets, feasible of construction, the impound capacity of the reservoirs during the flood time. With a channel dam or stream-bed reservoir, all the flow, above that required to fill existing ditches, may be held and used while otherwise it would be wasted and lost.

But one such reservoir of this character has been constructed across the bed of Poudre or its principal tributaries. This is Haligan Reservoir shown upon Exhibit 1 attached to the answer. This reservoir is part of the North Poudre System, and has been in use two years. It has proven of especial value because of low flow of the North Fork of Poudre River at intake point of the North Fork works during the late irrigation season, whereby this system

2089 was frequently embarrassed to effect exchanges by flows from its reservoirs lower in valley, because of there being, at the North Poudre intake, insufficient water in the stream to compensate in equal amount that which could be discharged from the storage below.

The Halligan is of great utility because of sudden flows in the North Fork, often rising to a discharge in excess of the aggregate carrying capacity of all ditches and intakes upon this tributary and the Poudre proper, which floods are generally too short in duration to admit of the filling of the reservoir by inlet ditches.

The Halligan Dam being across the channel, above the North Fork distributing works, the intake of the reservoir is of consequence equal to all the flow, and escapement below is required only to the extent necessary, with the lower stream augmentations, to supply the total capacity of lower intakes.

These interceptible flows sometimes come, though not every year, after the annual June freshets. They are of short duration, of sudden rise and rapid decline, accentuating the necessity of river-bed interception to prevent waste. These excess flows are variable in volume, date and duration, and afford the last opportunity of

Poudre appropriation. The volume in general is precarious, not dependable, and valuable only when employed to supplement certain and constant flow.

This development by stream-bed reservoirs is limited to the extent of feasible storage capacity at proper points within feasible cost.

The Elkhorn or river reservoir of the Greeley-Poudre which I have surveyed, is of this character.

Some floods of the North Fork will be available to the Elkhorn reservoir though the North Fork empties into the main stream below Elkhorn dam, for, when the North Fork floods are sufficiently copious to answer appropriation demands on the main stream below the confluence, it will leave all or part, as the case may be, of the Poudre flow at Elkhorn during the flush, for conservation there, without injury to senior priorities, and these waters may be discharged, after the flood subsides, into the distributing and storage works of the district below and the capacity of the Elkhorn stand ready for further employment as occasion may require.

The amount of possible storage from this freshet excess, is of course variant with the years, and not dependable as an annual certainty. Some years may afford none, some may give a quantity above the storage possibility. The amounts are variously estimated but it is probable that the supply available will be approximately as determined by experts and it is only by diligence of effort, and economy in management that a quantity sufficient, by this means and by diversions from all sources interceptible, stored and re-stored in time of plenty for time of need, that these district lands may be irrigated and reclaimed.

The necessities of economic use of water for irrigation arising from the requirement of a limited supply in service of an extended area, has produced in the Cache la Poudre Valley a practice of water exchange among appropriators, in effect inter-linking in a co-operative system, all the canals and reservoirs serving the territory. By means of this method, the duty of water has been extended and many canals, otherwise inferior, are raised to efficiency.

The stream flow is sufficient only in the early portion of the irri-

gation season. During this time all appropriators take and many store.

The reservoirs of a number of later projects lie at an elevation below their ditches, so that when filled the impounded water cannot be flowed upon the lands for which it is needed. Without exchange the storage would be useless and the land would fail of supply in time of greatest need. This requirement is supplied by exchange.

During the low stage of the river, water must pass into the canals of early appropriation. Later ditches with water impounded in storage basins, deliver therefrom to senior claimants and take from the river at their headgates an equivalent of that delivered, and thus late water is supplied to two areas with consequent benefit to all and loss to none.

2092 The total precipitation on the watershed of the Laramie River above the collection works of the Greeley-Poudre Irrigation District will not be taken from the Laramie Valley into the Cache la Poudre Valley. The seepage from the collection ditches of the district will be greater than from ordinary ditches. It will be much larger in volume than would result from the carriage of a like amount of water in a similar length of ditch upon the plains through the ordinary materials in which such canals are constructed. I cannot say, nor can it be determined before operation, what amount this seepage will be. The reasons for certainty of seepage however are here apparent — any observer. The ditches will seep as does the Sky Line Canal, which is built through material in character identical with that along the line of the new constructions. The slope of mountain side on which both ditches are to be operated is of remarkable similarity. The water to be carried in the ditches is clear and because of heavy grade the flow is rapid, holding any silt there may be in suspension and thereby preventing sedimentation; that is, ditches like the Sky Line and Greeley-Poudre Collection will scour. The interstices between the loose rock and boulders through which these ditches extend will allow the water to pass more freely than from ordinary canals, into the bed and channel of the stream below.

These escapements are not the only losses from the watershed above. The same conditions will prevail in the case of the new ditches as in that of the Sky Line. The precipitation on the watershed above the collection system cannot all be intercepted and carried for the following reasons:

2093 First. Excess flows from intercepted streams and mountain sides at times when the ditch is charged to full capacity.

Second. Loss during winter season, when through stress of weather, it will be impossible to operate the collection system, except as to that portion discharging directly into the tunnel.

Third. Seepage which will escape from the ditches after diversion on the way to the tunnel.

Fourth. Percolations passing down the mountain through the gravel, boulders and rock through which the collection ditches are constructed.

These flows from the watershed above the work will be of such

quantity that there will be at all times after completion and operation of the system, a running stream in the present bed and channel of the Laramie River from the tunnel reservoir embankment northward to Wyoming, which, augmented from that portion of the watershed in Colorado not intercepted or interceptable by the works of the district, the Sky Line and Wilson Supply or any other works possible of feasible construction to take waters from the valley to more profitable places of use, will aggregate a continuous Laramie River flow at the state line from Colorado into the State of Wyoming greatly in excess of all Colorado diversions; no part of which can ever be diverted or in any manner enjoyed by the State of Colorado or its citizens upon lands of that state. This is also true as to all waters of the stream rising in Colorado and discharging in Wyoming as well as the stream in the latter state, no part of which may ever be enjoyed by the state in which the stream has its rise.

2094 The principal points of control of district works on Laramie River are head gate location of East Side Collection Ditch at Deadman Creek, headgate of West Side Collection Ditch at Rawah, and the location of the portal of the tunnel. From the Poudre River side the point of control is headgate of Poudre Valley Canal. To make it clear, you cannot go further north than Deadman Creek to obtain water for diversion back up stream to portal of tunnel, and feasibility of works on that side of river *are* accordingly controlled by that point. West Side Collection Ditch may, however, be extended northward to intercept McIntyre Creek at point near where present state road crosses this creek. Cost would make project feasible. I designate tunnel as point of control

2095 because that is location of shortest distance between bed and Laramie River and bed and Cache la Poudre and formation of rock seems to be such that tunnel can be driven with safety and without expensive appliances.

There is no other feasible tunnel site by which waters of the Laramie River could be taken out of the watershed. The streams divert at point nearly opposite tunnel and from that vicinity northward, cost of construction of tunnel would be prohibitive. Cost of construction south of present location would locate long mountain ditch carriage and result in loss of more water.

Poudre Valley Headgate is at point of control because at point in cañon of Cache la Poudre River, and it would be impossible to change that location down stream for reason that lands of district as shown upon map Exhibit 1 attached to answer, could not be served, and it is impossible to change the location of the headgate upstream, on account of excessive cost of construction and

2096 operation. As you go upstream cañon walls prevent feasible construction. Cost of present ditch is very great and by moving ditch higher up stream from present location cost would be more prohibitive.

Have data from which am able to state total amount of bonds disbursed by district under construction contract with company. \$1,692,780.70 was paid out to company on estimate and \$304,000.00 of bonds was paid out of redemption fund of \$500,000.00 provided

in contract. In addition there was also paid to company the sum of \$1,000,000.00 in bonds.

Resided at Greeley two years prior to engaging in service of district as engineer. Was engaged in practice of profession and interested in developments of character such as this system. Became acquainted with project in general way. Knew generally of project which had first been initiated by Link and Akin and later upon which construction work had been done by company. This 2097 was before I was in service of district at all. Had some acquaintance with location and general character of proposed system under course of construction. Had acquaintance with contractor Knowlton before district was formed.

General plan of system was adopted before I became district engineer, though the district board considered carefully the whole plan and I assisted in this work. There were made some modifications of minor details through the whole scheme. Diversions, earriages, conservations and delivery were found to be on lines of feasible cost, and in main designed upon most economic lines.

Object was to build so permanently as possible and at same time to obtain greatest utility. Purpose was to obtain all water possible from the Laramie Valley, the Poudre and all other sources of supply; to store this and by whole system of works to afford district lands and its water consumers a sufficient flow and permanency of works to make tillage of whole area profitable venture by means of system calculated to accomplish greatest possible irrigation achievement economy could devise.

System had many bounds or controlling points. It must all be installed to afford sufficient supply and adequate works to all the lands burdened within limit of cost sustainable.

2098 System must have Laramie water so far as obtainable within point of control and added to this constant and dependable supply must enjoy obtainable flow from Poudre as well, and with both must have system of conservation and distribution to cope with situation. It is not to be presumed that every drop of flow of every stream tapped is to be taken or that completed system, when first employed, will be found perfect in all its parts. Experience will dictate betterments with use. This will continue for years. This is true in all irrigation enterprises. Line of demarkation between completion and maintenance is difficult of discernment. Betterments will come as necessity commands. This is not only true in this system but everywhere in irrigation constructions. Necessity is parent of ditch in all cases and construction is only to meet this necessity. In early constructions lack of rainfall is necessity of first ditch. Amplitude of flow warrants construction of early ditches without diversion dams because there is no necessity. These dams are later constructed as necessity comes. In Laramie Plains, for example, there has never as yet been a need of anything in way of dams but most primitive constructions, there has been no need of water officials to divide and no need of economy. Waste has been the rule because no necessity of conservation.

It is not, in the main, amount of flow, but economy of use and

command of the element that has given rise to the greater developments under irrigation operation.

Cross-examination by Mr. N. E. Corthell:

2099 In 1908 I procured some information about the Greeley-Poudre project by conversation with men in Fort Collins and Greeley who knew about it, and particularly through conversations with Mr. Hibbard, but I did not become connected with the project until June, 1909, and had no personal knowledge of the works prior to that time. During the summer of 1909 my principal work was that of inspection, although I did some surveying that summer throughout the entire district. The District was formed in April,

1909, and the contract was ratified and the bonds voted in 2100 October, 1909. The negotiations and interviews relative to the contract took place during July and August, and the contract was dated September 8, 1909. Under this contract, bonds were issued for the work, and in my testimony of expenditures I have referred to the payments made by the District in bonds.

2101 The construction of the power line to furnish power for the tunnel construction commenced the latter part of October, 1909. The contractor on the tunnel commenced necessary preliminary excavation about Thanksgiving Day, 1909, and the first shot in the tunnel proper was fired on Christmas Day of that year. The only work performed upon the system prior to my connection with it which could be noted upon my inspection was the work upon the Upper Rawah Ditch and the work upon the canal in the Poudre Valley, although there might have been some money spent on maintenance and operation. I would not say that this early work

2102 on the Poudre Valley Canal was primarily adapted to the diversion of water of the Poudre drainage. The original construction was for that purpose, but the extension and enlargement by the Laramie Reservoirs and Irrigation Company and the Laramie-Poudre Reservoirs and Irrigation Company, did not have that object primarily in view. The work upon the plains division was the extension of the Poudre Valley Canal system, but the Laramie-Poudre Reservoirs and Irrigation Company was not an extension of the Poudre Valley Reservoir Company, and the plans of the two latter companies relative to the use of this canal are entirely different.

2103 ent. The Poudre Valley Canal and its extensions intercept the tributaries on the north side of the Poudre River, but it does not collect their water because there are prior appropriations, and the Irrigation District can take the water of these tributaries only in times of flood, which is a very uncertain matter.

2104 The Company proposed to construct the Elkhorn Reservoir, with a capacity of 34,500 acre feet. A map for this reservoir, which was filed in the office of the State Engineer, was made by Mr. McFadden, an engineer employed by the Denver Tramway Company, and I believe the filing was made for power purposes. I am not familiar with the negotiations representing that reservoir,



but I know that the Laramie-Poudre Reservoirs and Irrigation Company must furnish the District with reservoir capacity on the Poudre River of 34,500 acre feet, either in the Elkhorn Reservoir or in one or all of the reservoirs shown on Exhibit 1.

2105 The Mitchell Lakes have been in operation for a number of years, how long I do not know, and some of them have early appropriations from some of the creeks. The other portions of this system which could be operated when I became connected with it are the part of the Upper Rawah Ditch now constructed, the Camfield Reservoir, which is in operation whenever there is any excess water in Crow Creek, and the McGrew Reservoir, which can be operated now through its inlet canal from Eastman Creek. The entire system is now largely completed, and there is no more of it which can be operated now than in 1909, although with the expenditure of a very small sum a large portion of it could be put in operation. Of course the Poudre Valley Canal has been in operation all of this time, together with the Douglas Reservoir, the North Poudre Reservoirs 5 and 6, and Bruce Eaton's Reservoir 8,

2106 but no part of the extension of the Poudre Valley Canal is now ready for operation, although with the expenditure of about 50,000, the Poudre Valley Canal and its extensions can be operated from the Poudre River to a point near Section 2, Township 8, Range 64. I do not know whether any use had ever been made of the Upper Rawah Ditch, and when I inspected the ditch in August, 1909, there was no water being run through it, but it was ready for operation and water had actually been run down it.

2107 At the time of the formation of the Irrigation District I would say that about 60,000 acres, or one half of the area proposed to be irrigated has been entered under the Homestead and Desert Acts, and this land can be subjected to the operation of the District only when final patents are issued by the United States, but the only way the desert entrymen can procure patent is by furnishing water which can be secured only from this system, and for such water they will have to pay the same amount as other land owners, and the same is true of the homesteaders if they desire water.

I would say that there was approximately 80,000 acres of

2108 deeded land within the District boundaries.

The lands within the Irrigation District can be irrigated only from the sources of supply afforded by this system, and, on the other hand, these waters cannot feasibly be applied to any other body of land than the lands within the Irrigation District.

2109 The burden of the cost of the system would be so excessive that half of the land within the Irrigation District would not be able to sustain it, and for that reason it is necessary to irrigate the entire area. Since the cost of construction has largely been paid for, this is still true of maintenance cost of the system,

2110 together with the small expense necessary to complete it being sufficient to prevent successful irrigation of any less than the entire amount of land within the boundaries of the District.

2111 I do not believe that anybody can state the precise amount of water necessary for the successful irrigation of these lands. In my opinion if 125,000 acre feet is applied to the land in the District it may be successfully farmed after two or three years devoted to saturating the soil and making the farmers proficient. This amount would be one acre foot per acre applied to the land, and this amount would have to be most economically handled. With any less amount, farming would be a failure. There have been large areas lying within the District and north and east of the District which have been cultivated to different crops without irrigation, but this farming has not been successful. I am not familiar

2112 with the dry farming region in Laramie County, Wyoming, but I am somewhat familiar with conditions in Weld County, Colorado, northeast of the Irrigation District, where a good many people from Iowa and Ohio are trying the so-called dry farming methods. I do not know how successful they are, but before they came in the same land had previously been taken up and dry farmed by others, and had been abandoned, this being a matter of history. In my opinion dry farming in Colorado has been a failure, and unless a dry farmer procures a way for irrigation he will be forced out within a year or two.

2114 The precipitation in the Greeley-Poudre District varies from year to year, but it never occurs at the time when it is most needed. My observation has been that the rains occur in April and May and early in June and that there is no rain of any consequence in July, August or September. The moisture required during the ripening month of August is not obtainable in dry seasons.

2115 I do not know what the average run-off of the Poudre drainage basin is, nor the maximum or minimum. I have made no particular study of this subject nor of the amount of water necessary to satisfy prior appropriations, and my testimony on the subject of the available water supply is based upon reports of

2116 experts. I would say that exclusive of the Greeley-Poudre Irrigation District the total amount of land under irrigation in the Cache la Poudre Valley is between 250,000 and 275,000 acres.

The ditches running through the Greeley-Poudre District from west to east, including the Central Lateral, were not designed primarily to gather up the seepage and return water from the upper ditches, but were built with the knowledge that the amount carried through them from the Poudre River would be augmented by such return and seepage waters. The amount of such return flow is indeterminate and cannot be ascertained until the District has been under irrigation for a long period of years. There is considerable loss from seepage in the first six or seven miles of the Poudre Valley Canal, due principally to the nature of the material through which it is constructed, which can be largely eliminated by improving that canal. In my opinion the loss in the ditches and extensions east of the Poudre Valley Canal would be very much less, but I made no estimate of the extent.

2118 The storage capacity of the different reservoirs of the Irrigation District now considered is as follows: Link Lakes, 2300 acre feet; Cobb Lake, 27,600 acre feet; Dowdy Lake 2990 acre feet; the Elkhorn Reservoir, 34,500 acre feet; McGrew Lake Reservoir, 19,734 acre feet; March Reservoir, 10,350 acre feet; Camfield Reservoir, 4,025 acre feet; Douglas Lake Reservoir, 2,300 acre feet; or a total of 103,799 acre feet. None of these reservoirs have been completed. Work has been done on the Cobb Lake, Dowdy Lake, McGrew Lake, March and Camfield Reservoirs, and one little reservoir called the Dover Reservoir, with a capacity of 322 acre feet, is constructed and ready to store water if any excess water comes down Lone Tree Creek or Wyoming does not

2119 take it away from us. The other reservoirs are not constructed in whole or in part. Douglas Reservoir is constructed and in operation, but the District's interest is in an enlargement which has not been made. These reservoirs are necessary to store water both from the Poudre and the Laramie Rivers during high water seasons, and it cannot be determined until the District has been in operation what part of the water used in the District will be carried to lands directly from the river and how much from reservoirs.

2120 The really dependable water supply of the District will come from the Laramie River, the amount secured from the Poudre River fluctuating greatly and being used to augment the supply from the Laramie. There will be years when the supply from the Poudre River and its tributaries will be practically nothing. Our plans contemplate taking all the water that it is possible for us to take from the Laramie River each year. It is possible to get only a certain amount from that river, and I do not believe that we can absolutely depend on more than half the required amount from the Laramie River. The very great floods on that watershed

we cannot consider because we cannot construct works to  
2121 take care of them. It is our plan and expectation to take all the water we can get from the Laramie River each year irrespective of the amount of water in that river from year to year. I have made no measurements to ascertain the amount of water which will escape from the East and West Side Collection ditches on the Laramie River, and this amount cannot be determined until the ditches are in operation. My testimony upon this point is based upon observations of the Sky Line Canal which loses considerable water in this way. I have made no calculation of the percentage of water lost through seepage in these mountain ditches nor the amount in acre feet per year, and have reached no conclusions upon that subject.

2122 The capacity of the Sky Line Ditch is 133 second feet and that of the Divide Ditch 200 second feet, my information about both of these ditches coming from persons connected with them and not from personal examination or measurement.

I have made no personal investigation of the conditions of water flow and irrigation in the valley of the Laramie River in Wyoming.

2123 The drainage area of Cooper Lake, which is included in the drainage area of the Laramie River basin in the map designated Exhibit 1, might really be termed a drainage area within a drainage area, as there is no outlet from Cooper Lake to the Laramie River, although one might be made. The same was true of the James Lake drainage area which now has an outlet into the Laramie River through the outlet canal of the James Lake Irrigation Company. Before the construction of that canal the waters of James Lake did not find their way into the Laramie River excepting for a possible seepage which may exist, as the elevation of James Lake is higher than that of the Laramie River.

2124 The amount of construction work completed on the different sections of the East Side Collection Ditch on the Laramie River is as follows: the Dead Man Creek division from Dead Man Creek to Nunn Creek is 98 per cent completed; the Nunn Creek division from Nunn Creek to Porter Creek is forty per cent completed; the division from Porter Creek to the Tunnel Reservoir is 14 per cent completed. The contract prices of these three divisions represented are \$90,000, \$5,600, and \$227,700. The percentage of the entire ditch that is completed is  $43\frac{1}{2}$  per cent. The amount of construction work completed on the different divisions on the West Side Collection Ditch is as follows: the Rawah Creek division, extending from Rawah Creek to Rapid Creek, 40 per cent completed; the Rapid Creek division, extending from Rapid Creek to Fall

2125 Creek, no per cent completed; the Fall Creek division, extending from Fall Creek to Mill Creek, 61 per cent completed; the Mill Creek division from Mill Creek to the terminus of the ditch, 100 per cent completed. The contract prices for these several divisions are respectively \$122,500.00, \$16,000.00, \$34,980.00, and \$18,000.00, so that the percentage of the entire ditch completed is  $48\frac{1}{2}$  per cent. I cannot state what percentage of the work upon the diversion dam at the tunnel has been completed. The embankment was originally to have been 56 feet high, but has been lowered so that we now plan a height of 26 feet, although it may be enlarged at a later date. The outlet conduit is 98 per cent completed. The Upper Rawah Ditch, including the McIntyre Ditch, is about 45 per cent completed.

2126 The work which remains to be done in the Laramie Valley is the completion of the cut from the river to the tunnel, the construction of the dam at the tunnel Reservoir and the completion of the East and West Side Collection ditches and of the Upper Rawah Ditch. The contract price of the approach cut from the river to the tunnel is \$25,620.00, and 79 per cent of this work is completed. The amounts which I have given as contract prices are payable in bonds of the District, or the District has the option to pay 95 per cent of such amounts in cash in lieu of bonds. Excavation on the East Side Collection Ditch commenced about April, 1910, and on the West Side Collection Ditch about the first of December, 1909, and work stopped on both ditches on October 1st, 1910.

2127 After I was connected with the enterprise no change was made in the tunnel except for the addition of some permanent reinforced concrete lining. No change was made in the line of either the East or West Side Collection Ditches nor in the structures already designed, but some additions were made on the East Side Ditch and the embankment of the Tunnel Reservoir was reduced from 56 feet to 26 feet, reducing the storage capacity of this reservoir from 174,000,000 cubic feet to practically nothing, as the 26 feet dam acts as a diversion dam only, and affords no storage.

2128 On the plains division some work was closed down about May 25, 1910, and the forces were transferred to other parts of the system. Some may have been laid off entirely, but I do not recall how many, and I cannot state what work was closed down in May or in June nor how much nor why, nor how much work had been accomplished by the middle of the summer of 1910. I can give the proportion completed up to this time.

The contract for the tunnel was upon the basis of \$32.50 per lineal foot and the length of the tunnel is 11,366 feet. In my statement of the cost of the tunnel I have included the entire cost of the power plant and of all the work that had anything to do with the tunnel as it stands today.

2129 The Elkhorn Reservoir is the only river bed reservoir to be constructed under the present contract. If any further river reservoirs are provided they would be outside the contract. The Halligan Reservoir, constructed within the last two years, is not a part of the Greeley-Poudre System, but of the North Poudre system, and I do not know whether its rights are subsequent to the Greeley-Poudre's or not.

The system of exchange of water in the Poudre Valley is based not only upon agreements but is based upon legal right irrespective of agreement.

2130 I do not consider the fact of the large loss from the East and West Side Collection Ditches through seepage as a merit or demerit of the system. The loss is unavoidable, as the cost of making the ditches water-tight is prohibitive, and if the ditches were made water-tight the District would still have to discharge more water for the benefit of prior appropriators.

Redirect examination by Mr. Charles F. Tew:

2130 In addition to two amounts of bonds which I have stated were paid by district, one from estimate fund (\$1,692,780.70) and one from redemption fund (\$304,000.00), there was fund of \$1,000,000.00 which was paid to The Laramie Poudre Reservoirs and Irrigation Company, for rights and properties which they owned at time of entering into district contracts.

2132 District sold \$50,000.00 worth of bonds at 95 cents to company out of total issue of October 4, 1909. Company paid for these bonds at different times, principally in \$5,000.00 lots. Paid in cash at 95 per cent of par. Bond for same date of issue as other bonds mentioned. All bonds are secured by district

lands and must be paid by lands served by district works. Lands are all burdened for both principal and interest for total bond issue.

Desert land entry holdings in District are part of land to be served by District works. These lands included in district by petition or contract. This area of non-deeded land was included in district by petition prior to September 8, 1909, date of contract with company. Prior to making contract with company, work  
2132 of fixing definite lines and enlisting in project full area to be burdened was in progress. This also applies to land held by homestead as well.

125,000 acres of land both patented and unpatented was contemplated to be served by district works at time of contract on September 8, 1909. Negotiations concerning water supply to be obtained and bond burden to be embraced and borne, concerned irrigation of 125,000 acres. These petitions which I mention are filed in State of Colorado. When entrymen have complied with law they received patents and lands at the same time are automatically made a part of Greeley-Poudre Irrigation District.

It will be necessary in operation of works to use some of storage capacity of reservoirs of District more than one time in each irrigation season. It is necessary in economic management of this  
2133 system, to employ some of these reservoirs for purpose of storage of waters available from both Laramie and Poudre at same time. These reservoirs are not to be simply filled from one source and held and discharged but once upon district land. It is necessary to use whole system in order to cope with water flows obtainable from all sources. Dependable supply from Laramie River may be carried directly through district ditches on Laramie to river for its carriage to district lands during time when no water is available for district from Poudre River. At times other than when water is being used direct on district lands, it will be stored in reservoirs for future use of district land. With Laramie waters thus  
2134 stored, there will also be stored waters obtainable from all sources including Poudre.

Am acquainted with Poudre Valley. Also had benefit of information of reports of superintendents and others. Have observed ditches being used; water flowing in them. Have noticed crops dependable for supply upon these ditches and reservoirs. Have noticed the different years and times when water was flowing in Poudre River in excess of that taken by several diversions from river. I make my statements from these general observations, investigations I have made, from reports of those engaged in agricultural business and other sources.

I stated that about 275,000 acres of land is now served by  
2135 Poudre River. This information I have obtained from superintendents of canals, reports, etc. In addition to that there are various areas irrigated by return water appearing after irrigation of lands above.

Reservoir in channel of Cache la Poudre River will not be used alone for conservation of excess flows of that stream. Will also be



used for storage of water from Laramie River. Storage of water in that reservoir will not be limited to that from any particular source at any given time. It will be necessary to use the capacity of this reservoir more than once each season in order to irrigate the district lands. It can be done. All of district reservoirs must be like-  
 2136 wise employed in order to serve district lands. All Laramie and Poudre water for district must be obtained from Poudre River through Poudre Valley Canal. It is the main artery of the system.

In addition to Halligan Reservoir, there are also other channel reservoirs in Poudre River. Chambers Lake on main river and Worster Reservoir across channel of Sheep Creek, a tributary of North Fork of Poudre River, are also channel reservoirs. They are small, high on the stream, and of inexpensive construction when compared with the Halligan Reservoir or Elkhorn Reservoir of district. They are so situated as not to be subject to heavy freshet discharge usual to lower portions of river. Chambers Lake  
 2137 and Worster Reservoir differ from Halligan and Elkhorn, in that they are in some ways more like the reservoirs on the plains and also depend in part for water from inlet ditches, while in the case of Halligan and Elkhorn Reservoirs, the stream itself is the inlet for the reservoir.

\$600,000.00 total estimated cost of Laramie River tunnel, in addition to cost of power, steel, drilling, and labor, included construction and installation of power plant and camp and equipment, tunnel equipment (outside of the drill steel), engineering expense, promotion expense, overhead, temporary and permanent linings.

D. A. CAMFIELD, a witness in behalf of defendants:

Direct examination by Mr. Charles F. Tew:

2138 Daniel A. Camfield, Greeley, Colorado. Lived in Greeley or within 25 miles for past 34 years. Located Greeley April 1879. Went to work on ranch about  $2\frac{1}{2}$  miles east of Greeley. At end of 9 months rented farm was working on. Farmed there one year and following year bought farm on what is known as Lone Tree Creek, about 9 miles northeast of Greeley. That was then  
 2139 eastern boundary of irrigated territory. That irrigated territory has been since extended and now extends to east side Crow Creek Valley.

At that time irrigated area in Poudre Valley was very much less than at present. Water supply for certain period of year was much greater than now, but great part of year much less than at present. Greater possibilities for farming now than then. Construction of ditches, reservoirs and more economical use of water has caused improvement.

After farming in vicinity, went into stock business, sheep, cattle and horses. Later located on Crow Creek about 25 miles  
 2140 northeast of Greeley. I have observed Exhibit No. 1 attached to corporate defendants' answer. My ranch was little south of Foston appearing on that map. Engaged in ranching at

that point from years 1883 to 1895. During that time became acquainted with character of land in district. I ranged cattle, sheep and horses over practically every acre of what is now the Greeley Poudre Irrigation District and had local ranches in other parts of the district. Existing irrigated area extends up to southern boundary of this district as indicated on map Exhibit 1. At time I was in stock business on Lone Tree Creek all north of my place was open range, and antelope were running over it at that time. It is now irrigated by the Eaton Ditch.

In 1883 I started flood water ditch to take flood waters of Crow Creek to irrigate bottom lands, for hay for stock use and irrigated 400 to 500 acres and raised 1000 tons of hay annually there. In 1887 started to build three reservoirs there. Crow Creek extends along eastern border of Greeley-Poudre Irrigation District 2141 lands. When I moved and located on Crow Creek there was constant flow of water in the stream. Water diminished after I moved there. Flood waters did not change but continuous steady flow got less until at the time I left there there was no water at all. Crow creek rises and flows a considerable portion of its distance in Wyoming. It heads in Wyoming and flows down into Colorado. People along this stream in Wyoming took out the water above with the consequence that it grew less and finally disappeared down in Colorado. There are ranches all along Crow Creek in Wyoming and Cheyenne gets its water from Crow Creek. There is continuous flow of water in this stream for considerable distance both north and south of Cheyenne. These diversions in Wyoming diminished the flow in Colorado.

2142 First ditch I constructed from Crow Creek was named Camfield Ditch. Reservoirs were called Reservoirs 1, 2 and 3, and one of ditches was called Outlet Ditch to Reservoir No. 1, and there was ditch called Coal Creek Ditch and Feeder to Reservoir No. 2. There was inlet ditch for Camfield Reservoir No. 3, about four and one half miles long, carrying 400 cubic feet of water per second of time.

Ceased operations in range business in Crow Creek Valley in 1895. Since then have been engaged largely in building and financing ditches and reservoirs. When I sold out, George West and I ran a line and tried to get water into Pawnee Reservoir, from South Platte River and found it would take a ditch about 104 miles long to reach the reservoir. At that time, I found, or thought it was impracticable to run winter water that far. In running that line we discovered two valuable reservoirs, one called Jackson Lake and one afterwards named Riverside Reservoir, both reservoirs are now constructed and in operation. Started surveys in 1895. One

2143 near Orchard, one near Hardin, and one near Kersey, all on north side of river. Pawnee Pass Reservoir lies northwest of Sterling, Colorado. During that winter ran three lines to Pawnee Pass Reservoir each 100 miles long. That is large reservoir and at high water line we ran would hold 7,000,000,000 cubic feet or about 150,000 acre feet of water. It has never been built. Subsequent to

my survey the U. S. Reclamation Service surveyed all one summer on inlet ditch to this reservoir, but only got half of it surveyed.

Jackson Lake and Riverside Reservoirs, discovered by us in our survey, are now built and in operation. At time Mr. West and I started survey, there was no storage of water in lower South Platte Valley and farmers could not raise valuable crops such as potatoes and beets. Crop was largely alfalfa and some wheat.

2144 At the present time there are three sugar factories and there are beets enough to supply these factories in that valley.

At that time there was great deal of land in South Platte valley between mouth of Poudre and state line under ditches but not cultivated. All that land is now in high state of cultivation. Would think the reclaimed area in Poudre Valley is now three or four times as much as then.

Bijou Canal in the South Platte Valley now irrigates section that was then Prairie, not a foot of which was under cultivation. Ditch had been built and abandoned. This canal was started in 1889, and in 1895 was entirely abandoned, gone partly to ruin, and there was not an acre of land under cultivation by the ditch. In 1895 there was not one reservoir developed in Lower Platte Valley. Reservoirs have been constructed since that time. I have been connected with Jumbo or Julesburg Reservoir, situate between Logan and Sedgwick counties in Colorado. It holds about 1,200,000,000 cubic feet of water and serves about 30,000 acres of land. Coming up the river I have been connected with the following reservoirs:—Point of Rocks Reservoir, holding 80,000 acre feet of water. It has dirt dams 87 feet high, about mile long on top and faced with reinforced concrete on inner slope. Inlet ditch of that reservoir is 61 miles and outlet ditch is 60 miles long. Next reservoir is Jackson Lake Reservoir, situated about 4 miles northeast of Orchard, Colo. It is constructed and in operation, and holds about 1,600,000,000 cubic feet of water. Inlet of that reservoir is about 11 miles long. Outlet is to river and supplies Fort Morgan Irrigation District and Hill Rose Irrigation District, besides some smaller ditches along river. Next is Riverside Reservoir, situate about five miles northeast of Hardin, Colo. It holds about 2,505,000,000 cubic feet of water. Part of water is discharged into river and supplies

2145 ditches lower down, but about three fourths of water is owned by the Riverside Irrigation District, which is irrigated by outlet ditch from reservoir 106 miles long. The next is reservoir on south side of river known as Empire Reservoir. It holds about 1,600,000,000 cubic feet and has been in operation several years and is now owned by the Bijou Irrigation District. It has short outlet ditch that runs from reservoir proper to Bijou Ditch.

The only other reservoir on lower Platte river is Prewitt Reservoir. It is situated south of Marino, on south side of river and furnishes water for three or four irrigation districts near Sterling. I had nothing to do with its construction.

2146 Have been engaged in construction and completing these reservoirs ever since 1895. Have followed no other business

than development of lands and construction of ditches, reservoirs and irrigation works, although interested in other business. All systems I have promoted, except Greeley-Poudre Irrigation District, are now in use for irrigation of land. Have used irrigation district methods of organization largely. In every instance, construction cost was to be borne by lands served.

Have been instrumental in construction of following irrigation works in South Platte Valley:

Julesburg Irrigation District, area 28,000 acres in Colorado and 4,000 acres in Nebraska. Latter land not in district. Total bond issue that district, \$500,000.00. North Sterling Irrigation 2147 District, comprising 80,000 acres with bond issue of \$2,080,000.00.

Hillrose Irrigation District comprising 16,000 acres but with small bond issue. They just bought a million Jackson Lake rights, I think, about \$100,000.00 bond issue.

Fort Morgan Irrigation District with area of 44,000 acres with bond issue of \$178,000.00.

Bijou Irrigation District, comprising 40,000 acres with \$800,000.00 bond issue.

Riverside Irrigation District, comprising 55,000 acres under irrigation but only 40,000 acres in district. Bond issue \$1,000,000.00.

Green City Irrigation District is quite small and comprises about 3,000 acres with bond issue of about \$42,000.00. I think that is all in the South Platte Valley.

Had to do with the promotion and completion of other reclamation projects than those in South Platte Valley. Was connected with and financed and constructed the Montezuma Irrigation District situated in southwestern Colorado, comprising 55,000 acres with bonded indebtedness of \$750,000.00. Also constructed Eden Valley Reservoir in Wyoming but had nothing to do with its financing whatever, and simply took it as a contract from Farson & Son Company and got my pay in cash.

It is my practice, after considering all elements of the district to finance it and construct it from bonds and securities of the district. Other than the Eden Valley Reservoir in Wyoming, I have been compelled to consider the various enterprises from every angle and decide whether or not the enterprise was meritorious for the reason that we had to take the bonds and dispose of them in order 2148 to get our pay. If bonds were not placed on good project there would be loss and failure. During these years I carefully considered each project that I have mentioned. We took into consideration many things but really there are three substantial elements necessary and significant to any good irrigation enterprise. First essential is good land, land that will raise valuable crops, land that is situated near railroads, whose elevation is such that they can raise potatoes, sugar beets, and other high priced crops. The next essential is sufficient water supply, no matter how valuable the land is, if the water supply is not sufficient the project must be a failure. The next essential feature, with land and water, is to construct necessary works to properly bring water to land and to

properly irrigate it. In promotion and construction of these large projects which I have built, have considered these elements in each venture. When new project is proffered, have to take into consideration amount water appropriated prior to your taking water, otherwise you will run short of water. During years of my  
 2149 engagement in this business, have had to do with all branches of promotion, except engineering and legal part, from consideration of the organization up to the disposal of the securities. A great many projects were brought to my attention and considered by me but not constructed. In such cases, made a study of water supply, land conditions and general feasibility before discarding projects. Have made such examinations for determination of feasibility of projects in Colorado, Wyoming and Idaho and New Mexico.

Have been instrumental in reclamation of about 300,000 acres of arid land in years of my engagement in the business, outside of Greeley-Poudre Irrigation District. Have very closely observed conditions of water flow of lower Platte River from mouth of

Poudre eastward throughout years I have mentioned. There  
 2150 has been large increase of return water. The reservoirs which I constructed receive their supply of water principally during winter. They receive some water in summer time. Every one of them is taking water today. The winter flow of water in the river from the mouth of the Poudre down to the state line is increasing each year. This increase is result of storage and application of water higher up on stream. Part of this water comes from lower Poudre. Major portion of it comes from Platte River and tributaries and secretions from seepage return. There is decided increase of water flowing in river between mouth of Poudre River and head of Empire Canal and it increases from there down to state  
 line. There is increase regardless of discharge of water into

2151 the stream. Increase into the river nearly every mile. Winter water stored in Empire Reservoir is discharged through outlet back into Bijou Ditch and thence to lands of Bijou Irrigation District west and south of Fort Morgan in the South Platte Valley. Seepage from these lands returns into South Platte River.

There is return water to river from reservoirs and lands served by reservoirs on north side. North Sterling, Sedgwick and all those ditches taken out on north side of river. Riverside Irrigation District lands return water to stream. Seepage returns from these districts reach stream above number of reservoirs I have described. In my opinion the operation of these reservoirs will bring about a continual increase of flow of water in the South Platte River from the Empire and Riverside Reservoirs down to the state line and that increase will be every day in the year. It will be a continuous,  
 steady inflow. It will be from return waters from the ditches.

2152 I base my judgment on what I have seen in the South Platte Valley and elsewhere.

Lands which I have been instrumental in reclaiming along the lower Platte, lie comparatively close to stream. Riverside Reservoir Outlet Canal 106 miles long starts at reservoir and runs in north-

easterly direction through part of Weld County and all of Morgan County and ends in Logan County.

It irrigates narrow strips of land not more than 8 miles wide.

Points of Rocks Reservoir irrigates about 80,000 acres of land lying in narrow strip along river and not more than 7 or 8 miles wide on average. The Riverside and Point of Rocks Reservoirs afford irrigation to large portion of Platte Valley on north side of 2153 stream towards state line. Julesburg Irrigation District extends into Nebraska. These three districts are principal systems on north side of river.

Green City, Bijou, Fort Morgan, Hillrose districts are ones with which I have had to do on south side of stream. Have had nothing to do with Prewitt Reservoir.

Developments along South Platte River of which I have spoken are later developments than those in Poudre Valley, where I reside, except the Greeley-Poudre Irrigation District. Prior to my operations in South Platte Valley, there were no reservoirs below mouth of Poudre. The reservoir systems were necessary in order to accomplish the development of which I have spoken. There was not sufficient water supply during irrigation season and reservoir would conserve water that otherwise would have gone to waste for nine months of year. Reservoir systems afford much higher use of water than ditch system for simple reason you have got it in storage when you can draw on it when needed, while in direct system you have to take water when it comes or not use it at all.

2154 The return water, which I have described in South Platte Valley, is from irrigation from lands in the Platte Valley and all tributaries. It comes from irrigation of lands on all tributaries.

Prior to 1890 practically all reclamation in the Cache la Poudre Valley was by means of ditches. Along about 1890 we commenced construction of reservoirs. I commenced later on South Platte Valley. Prior to my construction, Poudre River was taking and using winter and summer flow for irrigation. There were many reservoirs constructed prior to the time I began on the South Platte. No water used in reclamation of lower Platte Valley is from Poudre, except return and seepage water, and occasional floods. The only floods we receive are those which are in excess of the diverting capacity of all the ditches on the Poudre. There is generally such a flow every summer for a limited time. At about the same time there is usually a flood in South Platte Valley and other tributaries of the stream. It does not all come at the same time. Am

2155 acquainted with project known as the Greeley Poudre project, sometimes called project of Laramie-Poudre Company.

Am member of board of directors of that company. Was acquainted with lands contained in that project long prior to formation of district. Think I have walked over every section of land in the district. In surface conditions, depth of soil, fertility and the climatic conditions, the lands contained in the district are somewhat better than the lands further south. As you go north from Greeley to Carr Station the lands continually improve. Generally speaking the lands are similar but some of the soil around the Greeley blows



a great deal and comparatively little of the soil in the Greeley-Poudre District blows. It is a heavier soil. It is exceptionally well fitted for culture of beets and potatoes. Also for all other high class crops grown in Poudre Valley. It will grow cabbage, onions, sugar beets, celery and any other crops. It is 50 to 160 feet higher in elevation than other lands of Poudre Valley. Climatic conditions are exactly the same as those on other lands in Poudre Valley.

After you reach Carr Station, going north, there is a decided change for worse in character of lands. The hills immediately commence to rise very rapidly and quality of soil is not so good. It is rough, broken and rolling.

Early in 1908 I began consideration of proposed system of works, water supply and general conditions surrounding the Greeley-Poudre project. Had thoroughly familiarized myself with everything connected with the project long prior to that time. Became interested through efforts of Mr. Hibbard. Had several meetings with Mr. Hibbard and Mr. Duvall and also another engineer, Mr. Green. Also Mr. Charles R. Hedke, engineer. We went over entire matter and considered everything in Poudre Valley and on Laramie River. I was already very familiar with the Poudre River and the lands served by it, and had general knowledge of the Laramie River and the use to which water of that stream was placed. Had a general knowledge of use of water at Wheatland for farming. Was very familiar with annual freshet in Poudre very frequently running in excess of demands of ditches. At that time had general understanding of condition of works then in course of construction to accomplish diversions of Greeley-Poudre system from Laramie and Poudre Rivers. They had been working on the system prior to that time.

If works of Greeley-Poudre system are completed, I consider this the best by far of any irrigation project with which I have had any connection. I have never bought a foot of land under any other project with which I have been connected, but from my 33 years' knowledge of this land and its value, I bought two sections in the district and now own them. It is better than any other district in its location, character of crops it will raise and transportation facilities. Union Pacific Railroad has constructed two branch lines through this district at cost of nearly two million dollars. These railroads were built purely in anticipation of transportation business to come from development of this area.

Irrigation upon areas I have described in other districts has proceeded successfully. Between \$7,000,000.00 and \$8,000,000.00 of irrigation bonds have been expended in construction of works with which I have had to do, exclusive of Greeley-Poudre system. I am person who negotiated sale of bonds. These systems have been in successful operation as follows: Julesburg about 8 years, Fort Morgan about 9 years, Bijou 7 years, Montezuma 6 years, Riverside 4 years, North Sterling 2 years, Green City 7 years and Hillrose 7 years.

After making investigation of Greeley-Poudre project and considering the possibilities of same from every standpoint, I bought 23 per cent of stock in the Laramie-Poudre Reservoirs and Irrigation Company. Mr. Shields bought the same amount and Mr. Iliff and Mr. Thorp bought in about same time.

Approximately \$800,000.00 had been expended before we went into company. This had been expended in promotion and construction of system. Prior to my entering and purchasing stock, I had understanding with stockholders that I would buy only on condition that irrigation district would be formed as that was the only way to finance it so far as I could see. Soon after I bought into the company, we made arrangements for formation of irrigation district.

District finally formed in 1909. I had previously sold between \$7,000,000.00 and \$8,000,000.00 of irrigation district bonds to various houses in east like Farson Sons & Company of Chicago, Trowbridge & Niver Company and other similar institutions. Before entering into contract for construction with any districts, always made contract of sale of bonds to some house by which they agreed to purchase certain amount every month as fast as construction work progressed. I made an absolute and actual sale of the bonds. Conditions of contract were that I was to deliver bonds in stages, and then money was to be paid out on estimates of District Engineer and Board of Directors of District.

When I insisted that those lands of the Greeley-Poudre Project be formed into district, I had reference to same area that was to be served under works then in process of construction. September 1908 my company finally made contract with district for completion of project. Payment to be made in bonds.

2161 \$5,100,000.00 of bonds were to be issued. Our company was to receive \$5,000,000.00 in bonds and also obligated to buy \$50,000 bonds from district at 95 cents in cash. At time contract was completed between district and company, company placed in escrow deeds to all property, rights, franchises and works, and everything complete, and by so doing received \$1,000,000.00 in bonds. \$3,500.00 of bonds were set aside in Trustee's hands to be paid out as construction work on system proceeded, payments to be made on estimates by engineer of district and ratified by district board. After contract was made and ratified, the company accepted contract and proceeded to carry out construction work. Contract was dated Sept. 8, 1909, and we proceeded with work that fall. By terms of contract of sale of bonds, funds were to be furnished in amount of monthly estimates and not to exceed \$125,000.00 in cash per month.

2162 All bonds were sold to Farsons Sons & Co., under contract to be paid for in monthly payments beginning March, 1910.

We put men at work at both ends of tunnel as soon as possible and scattered outfit all through plains wherever we could let contracts and also put large forces in the spring on construction of mountain ditches. There were men and teams working on every part of the system.

My company bought controlling interest in Poudre Valley Ditch,

paying \$175,000.00 in cash. This we were to convey to district. We also purchased, subject to some outstanding rights, the Pierce Lateral for \$28,000.00. We disbursed cash for other portions of the work. We purchased right of way and some reservoirs owned by F. C. Grable, paying \$35,000.00 for these. We purchased direct from District \$50,000.00 in bonds, paying at the rate of 95 cents cash for same. We also purchased additional stock in Poudre Valley Reservoirs Company for Poudre-Valley Canal, paying cash for it, this with other stock previously mentioned constituted 57 per cent of stock of company. Some of stock was purchased prior to time I went into  
2163 company.

Established power plant on Poudre River side of Laramie-River Tunnel to run drills, furnish light and all kinds of power necessary for construction at both ends. It cost \$97,000.00. Tunnel is completed. We had large forces of men on mountain work, as well as on plains, in 1910.

Mr. Johnson, State Engineer of Wyoming, sent out letters all over country about time we sold Greeley-Poudre bonds to Farson Sons & Company, which was in December, 1909. Received copy of it. It stated that waters of Laramie River belonged to Wyoming, that we had no right to them and suit would be instituted to stop us from diverting waters from river and using them in Colorado. This was followed up by other letters, so Farson informed me. Clients of his had received numerous other letters to same effect. Not all of them came from same source. I think one came from chairman of a committee at Laramie City. Mr. Groesbeck sent  
2164 some. Letters were continual every three or four months.

First it would be State Engineer, then Governor came here once or twice and every time they came they gave out interviews to papers telling about suit they were going to bring against Colorado, and these interviews were given to United Press and sent all over country, and every so often we would receive letters from Farsons with these clippings that their clients had sent them and finally they got to be so numerous and so widely distributed, that bond sales practically ceased altogether. Farsons were unable to live up to their agreement or anywhere near it. There was no provision in our contract that released them from any such cause. Nevertheless they did not pay. After that time members of our company bought large amounts of bonds, and when our money ran out we borrowed large amounts from banks and signed notes and put up our own bonds as collateral to those notes in order to keep work going. In  
this way I spent considerable portion of my private fortune.

2165 These threats and interviews, so reported and reviewed through press, and circular letters from Mr. Johnston and others, most decidedly interfered with carrying out of construction work long prior to institution of this suit. This practice of giving out interviews and mailing letters commenced immediately after the ratification of contract by district during latter part of 1909. Project had then been in process of construction for a number of years previous. After commencement of this suit, efforts to prevent further sale of securities were a little worse. Effect of these letters and this practice has been to make it impossible for Farsons or individuals

to sell these securities to the public, and that in turn has had the effect of shutting down works largely or altogether.

From January, 1910, until December, 1911, work continued on project with large force and continued after December, 1911, and into 1912.

District still holds \$2,340,000.00 of their bonds. The balance, with exception of \$300,000.00 held by Mr. Iliff, Trustee, has been used, either sold directly or used as collateral, to get money and put into the works.

2166 Project has ample water supply and sufficient works to make it feasible if all water contemplated can be obtained from the sources to be tapped. It will stand out preeminent above all other districts in these regards. If district is prevented from obtaining the water supply from watershed of Laramie River, to be intercepted by its works, it will be a failure. It is necessary that the district have the use of all water obtainable from the Laramie River source.

Lands of Greeley-Poudre Project are now arid, grazing lands.

For such purposes their value is about \$5.00 per acre. That 2167 is only available use to which this land may be put without irrigation. From my knowledge and experience of lands in vicinity, these same lands would have value of from \$75 to \$100 prior to cultivation and as soon as water supply is assured. This would be in addition to bond burden of \$40 per acre. Lands will enhance in value. Values will ultimately be \$125 to \$250 per acre, depending upon location and improvements.

Cross-examination by Mr. N. E. Corthell:

2167 First surveys in the Platte Valley in which I was interested were commenced in 1895, and first construction work upon these projects commenced, I think in 1897. I do not recall that the year 1896 was exceptionally dry. Since that time I have 2168 been almost exclusively engaged in promoting construction of irrigation systems largely through the organization of irrigation districts. I have been interested in the organization of more districts in Colorado, probably, than any other person, but I have not organized a majority of them.

The enterprises I have described in the South Platte Valley have been largely dependent upon the return flow from the irrigated lands in the valley of the Platte and its tributaries, this return flow showing a continuous increase as irrigation is extended. I believe that more than 50 per cent of the water with which 300,000 acres of land in these districts has been reclaimed comes from return flow and the balance of the water is derived from the winter flow, which is stored, and the thirty days of flood water in the summer time.

2169 I am familiar with the lands lying immediately north of the Greeley-Poudre Irrigation District, which have a sale price of seven or eight dollars an acre and are substantially of the same quality as those in the Irrigation District.

2170 I became interested in the Laramie-Poudre Reservoirs and Irrigation Company in the fall of 1908, before the organiza-

tion of the Irrigation District. The process of organizing the District continued for quite a long time. There was one group which was very anxious to have the District extend farther north, and I spent perhaps \$15,000 in endeavoring to find a possible route for a ditch from the Laramie River around the mountains so as to get water as far north as Carr Station. That required six or eight months and we found the plan impracticable. This survey was made partly in the fall of 1908, and most of it in the spring and summer of 1909. We decided upon a tract of land that should be embraced in the District at the time of the organization of the District in April, 1909. The number of acres in the District was approximately the same when it was organized as now. Every entryman upon Government  
2171 land signed a contract to include his land in the District and pay taxes until patent was secured. All this was done about the time of the formal organization of the District. I did not buy in to the Laramie-Poudre Company until the other people interested had agreed to the organization of an irrigation district. Mr. Shields purchased his interest at the same time, and Mr. Iliff and Mr. Thorp bought in three or four months later, the four of us acquiring the controlling interest.

2172 The books of the Company and the statements of Mr. Hibbard indicate an expenditure prior to the time we bought in, of \$800,000, covering all kinds of construction work, promotion work and organization expense. In December, 1909, our Company purchased the shares in the Poudre Valley Ditch which were owned by the North Poudre Company, and we completed the payments on these shares in January or February, 1910.

2173 I do not have any of the circulars or newspaper articles which I stated were put out by the Wyoming people relative to this project, but I believe I can procure them and will do so, and I will also furnish the letter written by the State Engineer of Wyoming which I have mentioned. I remember that the Farsons once showed me a letter sent them by one of their clients and written either by the State Engineer of Wyoming or by a man named Fuller, and I will try to procure this letter. I will also endeavor to procure the letter I referred to written by Judge Grosbeck.

About March 1910 we commenced to encounter difficulty in selling bonds, which had been sold readily and at a more rapid rate than the contract called for prior to that time. I believe it was not until the fall of 1911 that we began to lay off men on the work, but

I will be able to refresh my recollection as to this date.

2174 There had been no default in the payment of interest by any irrigation district in the South Platte Valley in 1910, and only two districts in that valley had ever defaulted, the Riverside for the year 1910 and the North Sterling for the year 1911. By the time these defaults could have affected the sale of bonds the sale had already stopped. Farson & Sons sold the bonds of the North Sterling District, and one half of the bonds of the Riverside District. In the last two or three years there has been no market whatever for Irrigation District securities.

Cross-examination by Mr. John D. Clark:

2175 The Laramie-Poudre Reservoirs and Irrigation Company raised money they had spent before I entered the project by the sale of stock and bonds. \$375,000 of stock had been sold at par or above par, and the balance of the \$800,000 had been raised by the issuance of bonds. I do not believe that more than 15 per cent of the amount expended was for the purchase of lands and water rights in the Laramie Valley. The purpose of buying these lands and water rights was to use the water on the land of the Greeley-Poudre Irrigation District. If the water was used on the hay land in the Laramie Valley the early part of the season and on the lands of the Irrigation District the rest of the year the diversion would not injure the Laramie Valley lands, but if the water was diverted into the Poudre watershed the whole year round, the Laramie Valley ranches would of course be injured. The Company bought the lands as well as the water rights.

2176 I do not know how much of the expenditure of the Company before I entered it was for promotion expense. In my experience with irrigation projects, promotion expense has been very small.

The other men interested in the Company had no plan for financing this project which appealed to me as being at all feasible. Bond Brothers, who held a controlling interest, were wealthy, and they had invested a large amount in the Company, but I do not know whether they intended to use their own funds to complete the project. I and my associates contemplated the use of our own funds

only for the purchase of stock, and intended to secure the balance of the money necessary to construct the system by the sale of bonds. We expended in the neighborhood of \$300,000 for stock. I did not agree with the plan that was proposed for the financing of this system when I entered the Company, and did not want to proceed with it. \$400,000 of bonds had been authorized at that time, and I believe they contemplated an additional issue, refunding those already issued. I think they were considering the issue of \$3,000,000 of bonds in the future. When I became interested in the project, I did not propose to enlarge it by increasing the acreage to the irrigated, and the extent of the system we proposed to construct was not changed from that contemplated by Mr. Hibbard. The additional \$2,000,000 which we proposed to issue over the \$3,000,000 of bonds proposed to be issued by the former

2178 controlling interests, was to furnish \$1,000,000 for the work already done, and to take care of the difference between the par value of the bonds and the amount of cash procured for them.

Redirect examination, by Mr. Delph E. Carpenter:

2178 I lived in Crow Creek Valley during portions of early '90's. Have observed some dry farming that went on in eastern Weld County during '90's and previous. Little towns, Keota, Buckingham, and several other towns along the line of the railroad sprung up and got to be towns of 300 to 400 people, along



about 1890, 1891 and 1892. In 1895 there was nothing there. There were thousand of acres under cultivation in the early '90's that were subsequently abandoned entirely. Buildings and fences and all improvements in inclosures where farming had been attempted were sold to men in the irrigated district and hauled off to other lands along the Platte and some of them over to Greeley. In 1900 that entire country was back to cattle and sheep again. There were no dry farmers left. There were no buildings left in these towns outside of the section houses. There was school house at Buckingham which later burned down.

2179 Present generation of dry farmers is attempting deep cultivation somewhat. They are attempting to farm the same and even more extensive areas without the use of water than they were in the early '90's.

Market for the Greeley-Poudre bonds had depreciated for the reasons I have given, prior to the default of any other districts.

Recross-examination by Mr. N. E. Corthell:

2179 The present method of dry farming has arisen within the past ten years.

2180 A. A. EDWARDS, a witness for defendant.

Direct examination by Mr. Fred Farrar:

A. A. Edwards, Fort Collins, Colorado. Age 62 years. First came to Colorado in September, 1869, from Pennsylvania. When came here in 1869 remained about ten months and returned to Penn. July 1870. Fort Collins was my residence between 1869 and 1870. Again returned to Colorado in August, 1876. Located at Fort Collins. That has been my home since August, 1876.

Since August, 1878, first worked on farms and ranches and then in railroad office at Fort Collins about three years. Worked in flouring mill business about one year. Elected county treasurer and occupied that position 5 years. That was from 1886

2181 to 1890 inclusive. After that was in abstract business and still have interest in company, but in 1891 became interested in irrigation business. Was secretary and member of board of directors of The Water Supply & Storage Company, organized in 1891. Filled office of secretary 3 years and was then elected president and manager of company and held that position until January, 1910. Elected president of company in 1895 and held that position until 1910. As secretary of company from 1891 to 1895 had charge of books of company and was also treasurer. Was also member of board of directors during that time. These positions brought me in touch with administration of affairs of company. In July, 1910, I took position of manager of The Laramie-Poudre Reservoirs & Irrigation Company and occupied that position until September, 1911. Early in 1912 was elected secretary and manager of The Mountain Supply Ditch Company and still occupy that position. During that time The Mountain Supply Company and the North

Poudre Irrigation Company consolidated, so now the latter company is the owner and operates the system that I had charge of.

Have done some inspection work for the United States  
2182 Reclamation Service. This work consisted of inspection of construction work and operation features on four projects of the service. My work required reports and recommendations. Inspected and reported on Belle Fourche Project in April, 1913, Sun River, Milk River, and Huntley project in June and July, 1913. Belle Fourche Project is in South Dakota. Other three are in Montana. I reported on quality and character of construction in different structures and on operation and relation of management towards settlers under project. Reported on feasibility of proceeding with construction work which had been suspended by the Reclamation Service on Sun River Project. Original estimate of that project was \$10,000,000.00 and they had expended ten per cent of that and question was as to going ahead and expending ninety per cent and completing project. I reported recommending that they go ahead and they have since let contract for construction of the main system.

Have been member of board of directors of The Poudre Valley Reservoir Company from 1910 to present time. This project,  
2183 the Mountain Supply Ditch Company and the North Poudre Irrigation Company as well as the Water Supply and Storage Company are all located in the Cache la Poudre Valley in northern Colorado. They all serve lands in the Poudre Valley.

Have been on State Board of Agriculture since 1905 and am president of board. Been president 5 years. This board has charge of State Agricultural College and Colorado Experiment Station. Experiment Station is part of Government Experiment Station. That is, it receives money from Government for experimental work under Hatch and Adams Acts of Congress. Station also has charge of expenditures of state appropriations for experimental work. Work  
of station is not limited to immediate vicinity of College.  
2184 It extends over every part of Colorado more or less. In general work of Station is in prosecuting experimental and research work in all different lines of agriculture, live stock and other similar branches.

We are carrying on co-operation work with the Bureau at Washington on Irrigation Investigations. Have erected irrigation laboratories at College during last year and are conducting experiments in connection with the Bureau of Irrigation Investigations at Washington. The work in laboratories consists principally of experiments in measuring water.

I am also commissioner of finance for City of Fort Collins.

In coming to Fort Collins in 1869, came on Union Pacific Railroad to Cheyenne from Omaha, and from there to Fort Collins traveled overland. There was no railroad across or in Poudre Valley at that time. In fall of 1869 Denver Pacific Railroad was constructed across valley to Greeley. It was built from Cheyenne south towards Denver. It reached Denver in spring of 1870. This  
2185 road now constitutes a part of Union Pacific Railroad. It was first railroad constructed in northern Colorado. It crosses

Poudre Valley in Weld County from northwest to southeast and runs southwest along Platte into Denver. Line of road is at right angles to trend of Poudre River.

From September, 1869, to July, 1870, I traveled through the Poudre Valley from Laporte to the South Platte River. Laporte is situate at point where Cache la Poudre emerges from mountains, about 4½ miles northwest of Fort Collins. In 1869 Laporte had population of about 200 people. Fort Collins was not then incorporated. It was about size of Laporte. Troops had left Fort Collins two years previous.

2186 Towns of Windsor, Eaton, Ault and many of these other small places were not then in existence. Greeley was not in existence when I first came.

In 1869 Poudre Valley was almost all of raw prairie lands. There was some farming close to streams on first bottom, small farms raising grain, oats and vegetables, stuff that was marketed in mining camps in mountains. Principal crop then raised was native hay. This was limited to Poudre Valley bottom. There were then small ditches close to river. Irrigated area at that time consisted of strip of land on each side of stream. There were ranches scattered along stream from mountains to mouth of stream. Mouth of Poudre River is about 4 miles east of City of Greeley. Strip of land cultivated in 1869 would vary from one-fourth to one mile in width.

In 1869 would say about 4,000 to 5,000 acres were under irrigation. That is a mere estimate made from recollection.

2187 On each side of this narrow strip thus irrigated the lands of the valley were prairie grazing and unfenced lands. Native prairie only.

August, 1876, returned to Poudre Valley. Came over Kansas Pacific Railroad to Denver and drove across country from there to Fort Collins. Denver Pacific Railroad was then in operation between Denver and Cheyenne. Nearest railroad station to City of Fort Collins was Greeley. Greeley is 25 miles distant from Fort Collins in straight line. No railroad in Fort Collins in 1876. In 1876 Greeley was organized and had population of 1000 to 1200 people. Greeley was in connection with colony recommended by Horace Greeley and organized by N. C. Meeker. In 1876 Fort

Collins was about the same size as Greeley. There had been considerable development in Poudre Valley between 1870 and 1876. Number of larger ditches had been constructed extending out to bench land on either side of the valley. Canal of Union Colony of Colorado at Greeley had been constructed and up near Fort Collins two or three larger ditches had been constructed on south side of valley. At Greeley two canals, known as Union Colony No. 2 and Union Colony No. 3 had been taken out, one on north side and one on south side of valley. The agricultural area had extended out from river bottoms. In 1876 area of land irrigated or susceptible of irrigation from ditches then constructed would be about 40,000 acres. Growth of towns in valley had been consistent with enlargement of irrigated area. From

1876 to present time had had occasion to follow agricultural conditions and development in Poudre Valley. Fort Collins has been my home continuously. While I have been interested in 2189 the abstract of title business, have had no active part in management. Since July, 1891, my personal attention has been given almost exclusively to irrigation and kindred matters.

Since 1876 there has been continual development in Poudre Valley. New irrigation systems have been constructed and land irrigated has grown steadily larger.

First railroad built into Fort Collins in 1877. Colorado Central Railroad. Road constructed from Golden, Colorado, up through towns of Boulder, Longmont, Loveland, Fort Collins and on to Cheyenne. That portion of road from Fort Collins to Cheyenne was abandoned in 1883. The Colorado and Southern Railroad has

recently constructed a line from Fort Collins and to Cheyenne. 2190 In the 80's there was railroad constructed running up

and down Poudre Valley from Fort Collins to Greeley. Towns of Timnath and Windsor and other smaller stations are located on this line. The railroad now running from Greeley to Fort Collins, from Fort Collins to Cheyenne, and from Fort Collins to Denver, all belong to and constitute a part of the Colorado and Southern Railroad System. This is a railroad system extending northerly and southerly from the Gulf of Mexico with contemplated connection with Seattle.

Lands of Poudre Valley are now in high state of cultivation where irrigated. There are from 275,000 to 300,000 acres of land under cultivation and watered from different irrigation systems in valley. My work has given me wide experience in matters pertaining to agriculture. Present development of Poudre Valley compares favorably with that of every other section of irrigated country in west. I think it excels anything that I have seen, with perhaps the exception of Salt River Valley in Arizona. The country around Billings, Montana, I think was very similar and perhaps equally productive with section in northern Colorado. Factors which have gone to make Poudre Valley successful agri-

2191 culturally are soil, water supply and climate. Development would have been impossible without irrigation. Without irrigation these lands would be fit only for grazing.

Towns and cities in Poudre Valley are modern towns with modern homes, water systems and electric lighting systems and every convenience of modern towns. These municipalities are dependent almost altogether on the farming communities surrounding them. The larger towns and cities of the valley are: Fort Collins, Greeley, Windsor, Eaton, Ault, Severance, Lucerne, Timnath, and a number of smaller places. I have not attempted to give complete list of smaller places. In 1910 census Fort Collins had population of 8,210. Greeley had population of 8,179. Eaton had population of about 2,000 and Windsor about same. Ault had population of about 1200 and Severance about 300. Greeley and Fort Collins are modern,

2192 up-to-date towns. They have street car systems in each town. Agricultural College of Colorado is located at Fort Collins

and State Teachers' College of Colorado at Greeley, with very large attendance at both institutions. There is large beet sugar factory at each of cities of Fort Collins, Greeley, Eaton and Windsor. These factories are for manufacture of sugar from beets grown in valley. Cities of Fort Collins and Greeley obtain their domestic water supply from Cache la Poudre River. Water is diverted from river at base of mountains west of Fort Collins and carried to each city through pine lines by gravity system. Each city owns its own municipal water plant. Diversion point of Fort Collins water-works is about 15 miles from city. Foothills of mountains are about 5 miles from Fort Collins. Fort Collins water system cost about \$300,000.00. Diversion point of city of Greeley municipal water system is about 10 miles northwest of Fort Collins. Pipe line from diversion point to city of Greeley is about 35 miles. Town of Windsor also receives water from the Greeley system.

2193 Principal crops raised in Poudre Valley are: alfalfa, wheat, oats, barley, potatoes and sugar beets. The land lying north of river and in Weld County is particularly adapted to raising potatoes. Section lies from Greeley to beyond Ault.

Am acquainted with lands that form Greeley-Poudre Irrigation District. The area of the Poudre Valley now devoted to the cultivation of potatoes lies immediately south and adjacent to the Greeley-Poudre Irrigation District. The potato industry is developed to a very large extent in this community. A large acreage is devoted to the industry and a large yield of first class potatoes obtained. The product is famous throughout the country as the Greeley Potato. Owing to a blight, the potato crop in this section of the country has not been a success during the past two seasons. During the year 1913 crop was practically back to about former standard. This blight which affected this area was wide spread. It was so serious in all potato districts that the experiment stations

2194 throughout the country and the government itself made extensive investigations.

Normal yield of potatoes in Greeley District is from 125 to 300 sacks per acre. I would say average yield was about 200 sacks per acre. Sack holds about 2 bushels, 118 to 120 pounds to a sack.

Alfalfa crop yields from 3 to 5 tons per acre. Three cuttings are obtained. Alfalfa is basic crop of community in my opinion. Wheat is pretty extensive crop, yielding from 30 to 50 bushels per acre.

Oats produce from 50 to 90 bushels per acre, would say average about 65 bushels.

Sugar beets produce from 17 to 20 tons per acre. Would say about 35,000 to 40,000 acres are devoted to this crop in valley. These beets are sold to sugar factories of the Great Western Sugar Company. Price obtained for sugar beets was \$5.50 per ton for all running as much as 15 per cent sugar. Additional 50 cents per ton was paid for every one per cent sugar above 15 per cent.

2195 Rate is obtained on sliding scale, based on percentage of sugar content. Average price I think is about \$6.00 per ton. In order to give idea of magnitude of enterprise, will state that Fort Collins factory was originally constructed for 1200 tons

of beets every 24 hours, but they slice and work up about 2200 tons every 24 hours now.

There are great many vegetables of all kinds cultivated in valley. There have been crops of cabbage this year with large returns. These cabbages are raised generally for shipment to markets in Texas, Oklahoma, and other southern countries. Would not be able to give average yield. Know of one yield of 20 tons per acre. Mr. Hice had 30 tons per acre. Am unable to give market price obtained.

2196 Onions are extensively raised. It is valuable crop and raised for export to southern points. Delta country from Greeley down as far as junction of Poudre with Platte is perhaps largest onion raising section. Then again in neighborhood of Laporte, a great many onions and cabbages are raised. Laporte is close to foothills west of Fort Collins.

Fruit is extensively grown. More in upper end of valley near foothills than near Greeley further east. Apples and cherries are principal fruits. In southern end of valley canteloupe and melons are quite extensive with large yields. Fruit culture is quite successful in Poudre Valley. Largest apple orchard we have is the McClelland Orchard near Fort Collins. He realized some \$7,000.00 out of his crop this year already. Largest cherry orchard is the Mogg Orchard, 2 miles north of Fort Collins. He has sold \$8,000.00 worth of cherries and apples. He has apple orchard in connection with cherry orchard. The McClelland orchard is 5 miles

2197 south of Fort Collins and contains about 250 acres. Mogg's cherry orchard occupies only small area of about 40 acres. These orchards are typical of general yield of apples and cherries in that vicinity. I remember them because they are two of the largest.

Wheat raised in Poudre Valley is practically all ground and used at mills at Fort Collins, Greeley, Windsor, Eaton and Severance. A number of other towns have elevators. Poudre Valley exports cereals and cereal products.

Practically all of products raised in Poudre Valley are exported. Sugar beets are exported in form of sugar. Alfalfa industry affords large amount of hay and every winter season large numbers of lambs are fed and fattened for eastern markets. About 300,000 lambs are fed and fattened each winter besides a large number of beef cattle. The lambs are raised in southern Colorado and northern New Mexico, and a great many in Wyoming; southern Wyoming along the line of the Union Pacific Railroad up to the western border. Lambs are obtained from Laramie Plains. These lambs are brought in for feeding purposes during fall of each year. They are

2198 shipped from Poudre Valley to Omaha, St. Joseph and Kansas City more than at any other points. Also to Chicago and quite a number of them are marketable in Denver. They go directly from feed lots to packing companies.

Lambs are fed on beet pulp and alfalfa hay and finished on corn and ground barley. Corn used in fattening is imported into state



from other sections. Beet pulp is the pulp left after sugar beets have been sliced and sugar extracted.

Cattle fattened in Poudre Valley are largely raised in neighborhood. A good many are raised in mountain districts and many on farms in valley and large numbers are shipped in from outside parts. Those produced in Poudre Valley are either raised in mountains or on plains or such as farmer is able to raise in connection with agricultural work.

The farming section is not a live stock country in the sense of production. The farms are too valuable to afford any part of them to be used for pasture.

In early days when I first came here, practically all of that land now devoted to farming was devoted to the raising of live stock. Live stock production has given way to farming because farming is a better paying business. It pays better to raise alfalfa for feeders than it does to grow stock on the land.

2199 Beet tops furnish a great deal of food for lambs and cattle during fall and winter season. The tops are left on the ground at harvest. After the beets are taken from the field, stock is turned in on tops and they are very beneficial. The top is cut off just as soon as the beet is taken from the ground.

Sugar beets produced within one or two miles of factories are delivered directly to factories. Most of beets are hauled to beet dumps on railroad and there loaded on cars and from there shipped to factory. Facilities for transportation of beets are very good. The Colorado & Southern Railroad, the Union Pacific Railroad, what we call the Sugar Road, with many beet dumps along the lines, where the roads gather the beets. The Sugar Road runs from southern part of Larimer County northeasterly through town of Windsor and through Severance over to Eaton. As matter of fact, valley is completely threaded with railroad lines or spurs which are placed there for transportation of farm products. The price paid for sugar beets which I just gave is that paid for beets in the condition of delivery over the beet dumps by farmer. Beets are 2200 transported from loading stations to factory at expense of company. The beet dumps are merely chutes permitting unloading of wagon by mechanical means.

Beet tops sell from \$3 per acre up. I know of farmers who prefer to feed the beet tops to their own stock rather than to take \$7 or \$8 per acre for them. Mr. Cuthbertson and Mr. Bransom, two of our farmers, told me they could make \$15 per acre off of tops by feeding them to their own cattle. It is practice in Poudre Valley to feed forage crops upon premises insofar as possible. Advantage is obtaining fertilizer in form of manure.

Alfalfa is basic crop of Poudre Valley because of fertilizing properties. It is usually sown with some other crop, oats or some like grain, though quite often they sow the seed by itself. After 5 to 7 years the alfalfa is plowed under and followed with a crop of wheat or sugar beets. Also potatoes. Alfalfa is a great fertilizing crop.

It keeps the land up. They adopt a system of rotation of  
 2201 crops with alfalfa as the basis. It is a nitrogenous crop. It adds to the lands substances which other crops take away. It is a perennial. In some countries it is known as lucern.

There is uniformity of value of agricultural lands where water conditions are similar, in Poudre Valley. Farm lands under reasonably good irrigation ditches and systems will have an average value of from \$100 up to \$250 or \$300 per acre. Some of smaller, more highly cultivated and improved tracts bring as high as \$300 per acre. Orchard land brings a much higher price. The values which I have given apply to agricultural rather than to horticultural lands.

Am familiar with lands lying under and irrigated by Larimer County Canal belonging to the Water Supply & Storage Company of which I was president. Values range from \$100 up to \$300 per acre under that canal. Head of canal is about 9 miles northwest of Fort Collins. The terminus of canal proper is at Union Pacific

Railroad in Weld County, 2 miles from Ault. Water is carried 15 miles further, by extensions of the canal. Following  
 2202 meanders of canal it is about 85 miles long. The Larimer County ditch is about 71 miles long and extensions are probably 15 miles. Lower end of canal and extensions lie just south of Greeley-Poudre Irrigation District lands. The extension known as Owl Creek Lateral enters southern boundary of the Greeley-Poudre District. The Pierce Lateral from the Larimer County Ditch is a part of the Greeley-Poudre system, but the Larimer County Ditch and its water rights does not form a part of the district system.

Larimer County Ditch was built in 1881. Lower end was constructed as late as 1885 or '6. It was built by Larimer  
 2203 County Ditch Company. In 1891 the Water Supply and Storage Company succeeded to property and franchises of the Larimer County Ditch Company. Water rights under original Larimer County Ditch Company were represented by contracts. They sold 600 water rights with one right for each 80 acre tract. Canal system was designed to furnish 600 eighty acre tracts with water. When The Water Supply & Storage Company was organized the water rights of the Larimer County Ditch Company were exchanged for shares of the new company, one 80 acre water right being exchanged for one share of the new stock, the par value of which was figured \$100. The new company is a mutual company of farmers and they manage affairs of company by electing board of directors each year and making assessments on the stock.

Mutual irrigation companies, incorporated under laws of State of Colorado, have their capital stock so arranged that the  
 2204 stock represents the title to the water rights of the farmer. Practically all the companies or associations owning the various ditch and reservoir systems in Poudre Valley are such mutual companies.

Larimer County Canal has carrying capacity of about 600 cubic feet of water per second of time. Source of supply is Cache la

Poudre River and from ditches that divert water from Laramie, Grand and Michigan Rivers.

Diversion of water from Laramie, Grand and Michigan Rivers of Larimer County Canal are diversions from streams from other watersheds. The first diversion from another water shed was from small tributary of Grand River. Next a diversion occurred from a tributary of Michigan River. Last the Sky Line or Laramie River Ditch was constructed. Later the main Grand River ditch was constructed. The later or main Grand River Ditch absorbed the first or smaller one from that source. In other words this canal system has three interwatershed ditches. Grand River Ditch diverts water from watershed of Pacific Ocean drainage. Grand River is tributary of Colorado River which discharges into Gulf of California.

Michigan River is tributary of North Platte, rises in North 2205 Park, Jackson County, Colo. Laramie River is tributary of North Platte river also.

These three inter-watershed diversion ditches were constructed because of fact that main decree of The Water Supply & Storage Company was one of last decrees granted on Cache la Poudre River. Water derived from Cache la Poudre River was insufficient to supply stockholders with water for crops and company went into higher altitudes and diverted this water from other watersheds to supplement supply that was obtained from Cache la Poudre. The three inter-watershed ditches discharge their water into tributaries of Cache la Poudre River some 60 or 70 miles upstream. It is then conducted down the stream to headgate of Larimer County Ditch. The Poudre River is utilized as a carrier of water from place of discharge in the mountains to the head of main canal. In effect, the stream is made a part of the irrigation system for carriage of this foreign water.

Sky Line Ditch from Laramie River was commenced in 1891 and finished in fall of 1893. Was secretary of company at that time and member of board of directors. Ditch is about 5 miles long.

Took about three years to construct it. That length of 2206 time was required to construct this 5 mile ditch for reason ditch is located at elevation of 9,300 and 9,500 feet above sea level and along steep mountain side through very rough country. Large part of country through which it flows, is timbered and very rocky, loose and solid rock and mountain side is very steep so that it was very difficult to keep material in place to form lower bank. Materials excavated tended to roll down hill instead of forming bank of ditch and had to be retained by log cribs below the ditch for large part of distance. One tunnel was constructed. The country was very hard to get into and very inaccessible because of steep mountains and lack of good roads. Another reason for time and expense of completing was that work had to be done between July 1, and November 1 of each year. Season is so short there. Snow and ice in spring prevents getting in there before July 1 and storms start early in fall and we could not keep men and teams in there after that very well. Our engineer, John Nelson, attempted to get into that region early in spring with force of men and in so doing

overdid himself and died. Cause of death was over-exertion and effort to get in there through deep snow.

Compelled to haul supplies from Fort Collins by teams. Distance 80 miles, nearly all the way through mountains.

Sky Line Ditch taps tributaries of Laramie River, principally West Fork. Headgate of ditch is about 3 miles below head-  
 2207 waters of that branch. Stream bed of West Fork of Laramie at point of diversion is about 10 or 12 feet wide on bottom. I refer to natural channel. When flow is normal in this branch of the river, a man could jump across the stream.

During flood time when stream is swollen it might be difficult to get across in that way. The Sky Line Ditch also intercepts a number of small tributaries of Laramie River between point of diversion and Chambers Lake. One-half Creek, Three-Quarter Creek, and Two and one-half Creek are the tributaries thus inter-  
 2208 cepted. These streams flow during early part of season but by August 1 there is very little water running in them. Most of them quit running at that time. In language familiarly used in east these streams would be called brooks or runs. They are small streams coming down from snow banks above. They are intercepted by line of canal.

We had trouble with slides on line of Sky Line Canal. Banks would slide both above and below canal. In one place the slide was of dry material and in another place of wet earth and vegetable matter. In order to hold these slides we built log cribs along upper side of ditch as retainers.

\$70,000 were expended in first three years in construction of Sky Line Ditch. This included engineering, construction and every expense connected with it.

2209 Cost of maintenance has been very heavy.

Carrying capacity Sky Line Ditch at lower end, the large end of ditch where it empties into Chambers Lake, is 130 cubic feet per second. That is what rating table shows capacity to be at high water mark. Former ratings were different. Earlier ratings showed larger flow than present or subsequent ratings. State engineer had ditch rated along with other ditches up there by a deputy and last rating gave amount of flow different than that formerly obtained. It seems that early ratings had been incorrect. I was always satisfied with early records. I was satisfied with them because we were allowed to take the same amount of water shown by the ratings down at the headgate on the main Poudre River, being satisfied with it I never called for a rating until State Engineer called for it. It is rather deceiving up there, anyone not acquainted with conditions could not tell what amount of water there was in the canal, not so well as he could in plains ditch. State Engineer who fixed rating lower than former amount was Prof. L. G. Carpenter. First  
 2210 rating was taken on new ditch just finished and of course after use for several years conditions changed. Ditch really should be rated each year and sometimes more than once a year in order to be exact, as conditions change. The velocity must have been slower than when we first measured it. This rating is at lower

end of ditch. It shows the net amount of water received into Chambers Lake. Of course all that was lost by seepage from canal was lost to us and went back down Laramie River. Character of country through which ditch is constructed tends towards heavy seepage. It seeps quite a good deal all along the line.

We kept ditch open during the winter through two seasons or attempted to keep it open by keeping a couple of men there to watch it and keep it open. We tried to keep it open by placing checks in places in canal so that ice would freeze over and water would run underneath but we found it impossible with small amount of water there to keep it from filling with solid ice. It would fill with ice and run over banks. We gave up trying to run water through the canal in winter season.

Sky Line Ditch usually open for running of water between May 10 and July 1, and runs then to about Thanksgiving time or the middle of November. Sometimes until December 1, depending upon season. Every spring it is full of snow and ice and men are sent in, usually 12 or 15, and they trench through, cutting narrow trench through ditch from one stream to next. They start water through trench and it makes its way pretty quickly cutting ice and snow out. Work of clearing is commenced at lower end. Trench does not have to be constructed all the way. Lower end of ditch is more easily kept clean because Two and a Half Mile Creek flows warm water from springs and it is easier to keep the ditch from there down open. This flow of warm water is not over 1 cubic foot per second. Just small stream of water there. Usually makes its way through, keeps running along through ice and snow. These creeks take their name from distance from lower end of ditch. Three-quarter Creek is  $\frac{3}{4}$  of mile of lower end of canal. At head of diversion works there is all earth diversion dam, wooden headgate and waste gate where water can be turned back into stream, or be carried down the ditch as owners may desire.

Headgate leading to ditch is closed during winter.

2212 During some winters we allowed water to run in ditch to sand gate below it. Sand gate intended to pull out sand. Later it was found impracticable to allow water to enter ditch at all during winter time. During time water was turned into ditch to sand gate it returned to Laramie River after passing through the sand gate. During winter water runs down natural course into Laramie River and thence into Wyoming. During time ditch is open are not able to divert all water from west branch of Laramie River. In month of July there is excess. Am not able to give maximum carrying capacity of ditch at upper end, but with 130 cubic feet maximum capacity at lower end, I should say there would be somewhere about 30 cubic feet at times coming in from lower tributaries, and that capacity of upper end would not be far from 100 cubic feet per second.

Sky Line Ditch discharges water into Chambers Lake. It was originally a natural lake and upper end of Cache la Poudre River. There has been dam constructed at lower end of this lake or outlet and water impounded there in excess of its natural storage capacity.

It is now used as a reservoir by the Water Supply & Storage Company. It was constructed as reservoir in 1882. Used to  
 2213 supplement supply for Larimer County Ditch. Waters from river for Larimer County Ditch were not sufficient without storage. The decree from Poudre River was very late and river did not afford water supply to the extent of the decree each season, and there was water shortage so that in order to supply consumers, more water was necessary and the reservoir and these mountain ditches were constructed to afford adequate supply of water for these 48,000 acres on the plains under the system.

Chambers Lake is about 70 miles from Fort Collins by wagon road. Larimer County Ditch was awarded decree for 463 cubic feet of water per second of time from the Cache la Poudre as of date April 25, 1881, and also appropriation from Chambers Lake Reservoir as of date July 12, 1882. My recollection is that construction was going on at lake about the same time *there* were constructing ditch on plains, during 1881-3. 463 cubic feet per second does  
 2214 not represent capacity of ditch. It represented capacity at that time but ditch was later enlarged. The Poudre River decree has nothing to do with water returned by system from Grand, Michigan and Laramie Rivers. Larimer County Ditch Company also constructed reservoirs numbered 1, 2, 3, 4 and 5, located just north of Fort Collins. They also constructed two reservoirs in mountains near Chambers Lake known as Lost Lake and Laramie Lake. They are small reservoirs. Lost Lake is about  $\frac{1}{4}$  mile east of Chambers Lake and Laramie Lake is northeast of Lost Lake about  $\frac{1}{2}$  mile. They were lakes originally caused by beavers but which were later utilized by the company as reservoirs.

These three inter-watershed ditches and these mountain reservoirs were constructed to obtain supply of water sufficient to afford irrigation to lands lying under Larimer County Ditch. Necessity for water for irrigation caused construction of these ditches and reservoirs.

Direct examination cont'd.

By Mr. Fred Farrar:

2216 Water diverted by the three inter-watershed ditches from the Grand, Michigan and Laramie Rivers has a special economical advantage. It is diverted from Poudre River above nearly all land under cultivation, and exchanges of water can be made on that fund of water with other systems, so that more land can be served and more crops irrigated. This exchange system is practiced to quite an extent in Poudre Valley. Mountain water can be delivered by water commissioner into ditches on south side of Poudre and served by North Poudre Irrigation System and system of Water Supply & Storage Company in exchange for mountain water, receives water from reservoirs belonging to The North Poudre Company Ditch, below line of North Poudre Ditch. Irrigation system of North Poudre Company lies on north side of river and generally



to north of Fort Collins. Its chief supply of water is taken  
2217 from North Poudre. They have some stockholders who are  
not directly under their ditches but on south side of river.

Plan is to give stockholders of North Poudre Company located on  
south side of the river, water from inter-mountain ditches belonging  
to Water Supply & Storage Company, and then in turn North  
Poudre Company gives Water Supply & Storage Company reciprocal  
amount of water into their ditches from some of its reservoirs  
lying down in country some 20 miles below intake of Larimer County  
Ditch. It is general practice. Larimer and Weld System takes water  
from reservoirs of Water Supply & Storage Company and in turn  
reservoirs under Weld System furnish water to Greeley No. 2 system  
and there is a general exchange of water among all the large systems  
in the valley. Practice of exchange permits these later ditches to  
take water directly from the river, which otherwise would be used  
by prior appropriators lower down the river and to compensate the  
prior appropriators by turning into the river or ditches an equivalent  
amount of water from the reservoirs. This system of ex-  
2218 change tends to increase area of irrigated lands in valley.

It tends to economical use of water from stream. If it were not  
for this practice, upper ditches and reservoirs would not be as effective  
as at present for irrigation of lands. Some of them would not  
have been constructed if this had not been possible. This exchange  
is recognized and approved by law of Colorado.

From January 1895 to January 1910, while president of The  
Water Supply & Storage Company, was also manager of system, had  
charge of distribution through main canal and from reservoirs and  
also had charge of maintenance and operation of the ditches in  
mountains from Grand, Michigan and Laramie Rivers and had  
general supervision over all affairs of company.

45,000 to 50,000 acres of land are irrigated by Larimer County  
Canal of Water Supply & Storage County. Lands under this canal  
are typical of general development and condition of lands in Poudre  
Valley. There are 600 shares, going to make up what is  
2219 commonly known as 600 rights, each right being designed  
to serve 80 acres of land. These rights or shares are worth  
\$3500 per share. That is their value subject to bonded indebtedness  
of about \$300,000 on whole system. It also has floating indebtedness  
of about \$100,000, making a total indebtedness of \$400,000. The  
bonded indebtedness of company itself is distributed over entire  
acreage and would amount to about \$9 per acre. Each share of  
company would, accordingly, be worth approximately \$4220.00.  
About \$52.75 per acre.

While president I found it necessary to be thoroughly advised on  
rights of our company and also rights of all other companies in  
valley. The dates of appropriations and amounts of water decreed  
to each system and found it necessary to be vigilant and watchful as  
to rights of our company in obtaining all water to which company  
was entitled on its decrees. It was question of eternal watchfulness.  
I found it necessary to be watchful at all times in interests of com-

pany. Necessities for water in Cache la Poudre Valley are so great that each appropriator is constantly on the lookout for advantage to be gained or for additional supply. Irrigated area in valley consumes all available water from Poudre watershed and also what is brought over from other watersheds. Lying to east of and beyond present irrigated area is vast body of as good land as is now under cultivation in valley, still demanding water for irrigation.

2220 With economical use, I think there is sufficient water now obtained from Poudre River and foreign watersheds to irrigate all lands now served. I include in that the proposed diversion from Laramie River. Mountain Supply Ditch System and North Poudre System have been recently consolidated and are now under one management. I believe there is sufficient water owned by the consolidated company to irrigate the land under the system. The two systems served in general, lands which are located in the same area. The lands lie together, and are intermingled. Before consolidation lands supplied by Mountain Supply Company were

2221 only fairly irrigated. They did not always have sufficient water for early irrigation of alfalfa. Consolidation affords a supply of water at all seasons when needed from main system of North Poudre Company. It facilitates more economical use and distribution. It is an advantage to both systems. Lands formerly irrigated by the Mountain Supply System get a better, early supply and North Poudre lands get better late supply than they formerly did.

Throughout Poudre Valley greatest economic benefit is obtained from available water supply. Methods are improving every year and experience of irrigators teaches them. Economy is increasing in use of water in valley and water serves an increased area from year to year as compared with what it formerly did. The duty of water in the valley is increasing. There is less waste of water and

2222 more intelligent application to crops. By duty of water I mean the amount of land which a given quantity of water irrigates.

When I say duty is increasing I mean that given quantity of water is irrigating an increased amount of land. General experience of irrigators in Poudre Valley is that duty of water does increase and has increased from earlier days. That is true of land irrigated from system of Water Supply & Storage Company.

Duty of water under Larimer County Ditch of Water Supply & Storage Company is about one acre foot per acre during season on diversified crops that are commonly raised under that ditch. My figuring is from amount which is delivered at lateral headgate to consumers.

Main distributing canal of Water Supply & Storage Company is 71 miles long and has capacity of 600 cubic feet per second at upper end. This water is diverted from river and carried through main canal and delivered at headgates of small canals all along the line throughout the ditch. These lateral headgates discharge water into small laterals or ditches that carry the water down to each farm unit. The water is measured over weir and delivered

2223 into lateral by management of company. After water is measured and delivered into laterals, water users take care

of it from then on to farms. In event more than one farmer takes water through lateral, the company does not assume to divide water in the lateral among consumers. The farmers divide the water among themselves.

Main canal is divided into four divisions. Four ditch riders attend to the distribution. Each ditch rider has from 17 to 20 miles of canal to superintend. Ditch rider is furnished with list of stockholders entitled to water and advised every morning of number of inches per share to be delivered. He regulates headgates to discharge water into laterals in accordance with this information and keeps record of deliveries. Information and permission to take water from stream is obtained from water commissioner of district, who supervises distribution of water of river to several ditches in order of priority. As superintendent of ditch I had to be governed by action of water commissioner as to amount of water obtained under decrees and franchises owned by company.

Cache la Poudre Valley constitutes one water district. Over 2224 this district there is one water commissioner. He is allowed as many deputies as may be necessary, depending upon circumstances. Duties of water commissioner of that district are performed thoroughly and actually. He is in direct charge. His whole time is employed in looking after distribution of water, especially through the irrigating season. Water commissioner of our district is on duty from four o'clock in morning until ten and eleven o'clock at night a large part of irrigation season. This complete supervision and control of water of river has been practiced for many years and ever since I had to do with distribution. I know at least since 1890 that has been the case. Water commissioner of Water District No. 3, which comprises the Poudre Valley, does not employ over three deputies. One is stationed up in mountains, where ditches from Laramie, Grand and Michigan are in operation. One other deputy looks after discharge from reservoirs in valley and other on patrolling the stream regulating main headgates of canals. Deputies

2225 supervising discharge of reservoirs regulate exchange of water from river. Deputies have telephone connection with commissioner and of course each deputy is supplied with automobile or horse and cart for travelling about.

In early history we had telephone lines connecting with water commissioners and with headgates of larger headgates on river. Shortly after I took management of our company, we installed telephone line of our own. We built about 40 miles of line, connecting up along line of main canal so we could keep in touch with ditch riders and employees of company. That was followed by other systems using telephone lines, but after number of years The Bell Telephone Company took over all lines and now they are part of the Mountain States Telephone Company's system and all connections are over the lines of that company. Almost every farmer and water user through the valley has a phone in his house and in connection with all water officials and managers of different systems throughout valley.

State Engineer's office takes measurements and keeps record of

2226 flow of Cache la Poudre River. In 1885 through cooperation of a number of ditch companies, a measuring weir was constructed on main river at point where river emerges from mountains. Weir was rated and record kept of discharge there. Automatic register was put in so the record day and night and flow of the stream was preserved. This was put in to facilitate greater and better distribution of water to various ditches.

Amount of water which canal may take from river is determined by water commissioner. Headgates are regulated, as a rule, by headgate man of company under orders received from water commissioner. As conditions demand, we receive orders from water commissioner or one of his deputies as to regulation of headgates leading from river. Changes are made every day. Sometimes when river is fluctuating, adjustment of headgates are made several times a day. As changes of headgates are made fact is communicated to superintendent of ditch and by him to various ditch riders

2227 I have mentioned. Ditch riders in turn regulate lateral headgates leading to consumers. There is complete system running from water officials down to individual consumers.

Water commissioner is under orders from division engineer. There are 5 division engineers in state. Each division comprises all water districts lying in one general water shed. Division engineers are under State Engineer of Colorado. There are a number of water districts in each water division. It is duty of division engineer to regulate distribution of water between districts. This is done in manner similar to distribution between various ditches by water commissioner in his district. State Engineer, division engineers, and water commissioners and deputies have jurisdiction over questions of economic use of water and preventing waste. Statute prohibits waste and it is duty of officers to enforce the statute.

2228 Water commissioner and deputies make practice of preventing waste in Water District No. 3, constituting Poudre Valley. Necessity for water in that valley demands most economic distribution and use.

2228 Am familiar with headgates and diversion systems of various ditches taking water from Poudre River. They all have headgates. Each has diversion dam leading into main headgate of canal. These structures were formerly of wood, but of late years nearly all of them are of concrete. Headgates are substantial structures built of concrete and steel with sufficient capacity of intake to fill ditch to maximum depth when required. This is general rule but does not apply to all ditches. Water is measured below headgates some distance. Rating weir is used. Weir is not really part of headgate. All ditches are equipped with measuring weirs. This is absolutely required.

Have been on Laramie Plains. First time in 1877. Was there six weeks or two months. Was at Laramie City and over on Little Laramie River for a time. From there went over on Big Laramie near Sheep Mountain. That is at upper end of Laramie Plains. Had occasion to observe development of

2229

region at that time. Passed through south end of plains in 1887, on trip to North Park. At later time made more extensive trip. Have been through on Union Pacific Road a number of times and have driven to Laramie City in automobile and from there followed river into Colorado to tunnel site of Greeley-Poudre District. Went from Laramie City right up to the river. Made that trip in May, 1910, and again in August, 1912.

(Mr. N. E. Corthell, counsel for Wyoming, states into record that Union Pacific Railroad was completed into Laramie City May, 1869, and reached Cheyenne sometime in 1868.)

2230 Know in general way of Pioneer canal heading on Laramie Plains near Sheep Mountain and running in general direction parallel to river down past Laramie. In traveling up river from Laramie City was traveling in general course along line of this canal. Am not familiar with ditch below or northward of Laramie. Only know that portion of it above Laramie. I made no definite investigation of this ditch. I did see country which lies in immediate vicinity.

Mr. F. C. Avery of Fort Collins, Colorado, made location survey of Pioneer Ditch. Am not informed as to date of construction. Assuming date of construction of ditch to be 1879, it was not constructed when I first visited Laramie Plains.

2231 In 1877, Laramie Plains was purely and exclusively stock country. There were great many cattle, sheep and horses there, especially sheep. First bottom lands were meadows used for hay. Don't remember any grain raised at all at that time. On my trip during 1910 and 1912 observed country has some of it been fenced and noticed construction of inlet-ditch into what they call Lake Hattie. Looked like some steam shovel work there from distance. Just after leaving Laramie and crossing river we passed demonstration farm of State University. Saw some crops in some of inclosures, demonstration crops I took it. Traveled up foothills to Woods Landing. Passed along road or lane with buck fences on either side. Buck fences are constructed of poles and posts. Posts are not set in ground. It is something like old fashioned saw horse, somewhat of a truss at each length and poles extending from one of these to the next. Country is more settled than in early date when I was there, more building and ranches along and more hay raised. By hay I mean native hay. I think I saw some alfalfa, that is, it had been sown to alfalfa. I did not notice particularly as to crops. We were traveling in automobile and could not see quite so well as though traveling in wagon. Saw evidences of agriculture.

2232 Development of Laramie Plains region along Pioneer Canal, which is older canal than Larimer County Ditch, has not kept pace with development under Larimer County Canal in Poudre Valley. There is no comparison between two. In 1912 saw several men and teams working on lateral on plains.

Will give my recollection of the impressions I had from general appearance and development of country along Larimer County Canal in Colorado to country along Pioneer Canal in Wyoming.

Country along Laramie River appeared to me to be very little developed there from the time I first saw it in 1877, except that it was fenced up more and more settlement, more ranches, and people living along and a good deal of stock. I saw in the fields quite a considerable amount of hay in stacks. Don't remember seeing any straw stacks, any threshings, or anything of that kind. No vegetable cellars or anything that indicated that they were raising potatoes or anything of that kind, and I don't remember seeing any grain raised. In Poudre Valley nearly every one has granaries and orchards and in the potato districts have potato cellars, corrals, barns and houses. Improvements on Laramie Plains look good as to

houses and corrals for caring for stock. They seem to be  
2233 pretty well supplied in that way there. I would not think

there is any comparison agriculturally between the two sections. Settlements and ranches above Laramie were mostly along road travelled. Over near Pioneer Canal line that seemed like new country still unsettled. Do not know country below Laramie City. It may be possible there is more development below Laramie than above. Am only testifying to those things I observed. Ranches along Laramie River seemed to be of considerable acreage and it appeared as though they depended largely upon stock raising. Ranch houses or habitations were not as numerous as they were along Larimer County Canal in Poudre Valley. Land seemed to be in larger tracts with each plant of buildings. Under Larimer County Canal in Colorado I would say the average farm was about

160 acres. Farms vary in Poudre Valley. Some near La  
2234 Porte and near towns of Greeley and Fort Collins are small tracts of from 10 acres up to 20, 30 and 40 acres. Out on benches farms run from 80 to 160 acres, some large. 160 acres would be above average, take ownership all the way through. Average in Poudre Valley would not be over 10 acres taking in all gardens and fruit tracts.

In Poudre Valley where crops such as potatoes, beets, cabbages and onions are raised and areas are devoted to fruit, 40 acres in either beets or potatoes would be sufficient for one family, and where cabbages and garden products are raised, from 10 to 20 acres will sup-

port a family. Beets require a good deal of hand labor.  
2235 Farmers contract with Mexicans and Russians for hand labor at so much per acre. To care for the crop, plant it, prepare the seed bed, irrigate, cultivate and harvest, beets require about \$40 per acre. A farmer owning 80 acre tract, who devotes portion of it to beets, also employs family of Mexicans or Russians who take contract for hand labor and who live on place in addition to inhabitants of farm.

Where cultivation of land is intensive in Poudre Valley, 80 acres will support two families. These beet laborers have large families of healthful children and get through the season without much protection from buildings. One Russian family takes care of not to exceed 40 acres of beets during the season. These families consist of husband, wife and children. They all work in the beet fields. Even the babies are taken into the fields. The climate is mild and outdoor life is preferable all the way through the season. These



Russians are a German speaking people. They are German-Russians, as I understand it. They came from German provinces of Russia. They are very thrifty, saving people who are accumulating wealth and are buying small farms in the community. They came to the country with the sugar factories.

First sugar factory in northern Colorado was constructed in 1901.

In passing through district along Laramie County Canal would find very few high tracts of lands not under cultivation. Some ridges or knolls would not be under plow. As matter of fact, all land susceptible of irrigation is under cultivation.

This is not the rule on Laramie Plains. The country there was pretty level and it could all have been cultivated. Cultivation was the exception rather than the rule. As I previously stated, there is very little evidence of crop raising, except native hay.

I became manager of the Laramie-Poudre Reservoirs and Irrigation Company in July, 1910. Succeeded Mr. Wellington Hibbard.

He lost his life in automobile accident about 50 miles west of Fort Collins. Was on his way to Greeley-Poudre Tunnel.

It was then in process of construction. East Side Collection Ditch and West Side Collection Ditch were also in process of construction at the time I became manager. They were all located and surveyed and some construction work was going on at that time. At that time they were drilling tunnel from both ends. Was manager of company until September, 1911. During that time construction work on these ditches and tunnel continued. Bore of tunnel was completed in July, 1911. Contract which Mellwee had was completed at that time. Work of lining tunnel was not completed then. It was completed after I had resigned. The District did that afterwards.

Charles R. Hedke was chief engineer of all work on the system up until a month or two before I resigned, and after that Mr. Stimson of Greeley succeeded him. Burgess Coy was engineer in construction of tunnel and collection ditches and of all work on the Laramie River.

All supplies for carrying on construction work on Laramie River and tunnel were shipped from Fort Collins to tunnel. They were hauled in by teams, freighted in. As I remember wagon freight rate for this hauling was \$1 per 100 at east portal of tunnel and \$1.25 per hundred at west portal, except heavy machinery. That was considerably higher. Some of supplies taken to west portal of tunnel came from Laramie but principally from Fort Collins. Some were shipped up from Denver to Tie Siding, Wyoming, and taken in from there.

Distance from Fort Collins to east portal of tunnel is about 65 miles and to west portal is about 110 miles around by Tie Siding through the Laramie Plains. It is about 50 miles from Tie Siding to west portal of Greeley-Poudre Tunnel.

We were unable to prosecute work of construction of collection ditches during all season- of year on account of high altitude and heavy snow fall. Construction work on tunnel continued during winter season. Obstacles in way of construction work met in con-

struction of Sky Line Ditch compared somewhat with those encountered in construction of Laramie-Poudre System. On latter system east portal was more accessible and at lower altitude than Chambers Lake county and Sky Line Ditch. Upper end of tunnel on headwaters of Laramie is quite similar to conditions on Sky Line Ditch. Ditches such as these cannot be constructed with the same ease and facility as ditches on plains. It is a radically different proposition. It is different in all ways. On plains construction can be largely done by machinery and men are more available and will work for less money. Teams cost less. Feed costs less. And expense of transportation of powder and all sorts of tools, implements and supplies is in every way more advantageous and economical on plains construction than in mountains. By economical I mean less expensive.

2240 Time for working at altitude of Laramie River Ditches extends from about July 1 to October 15, or November 1. On plains work can be prosecuted year around with very little interruption from storms. It is not difficult to get men to go on upper ditches but more expensive. Our forces had to be disbanded at end of each working season when you stopped work. Forces have to be reorganized at resumption of work next summer. We had to transport men in, and transport them out. They would not go in there to work and at the same time be at expense of paying their way. The roads over which transportation occurs are over rough mountains. There is a stage line running between Home Post Office at Zimmerman's on Poudre, some distance below tunnel, and Fort Collins. There is no regular means of transportation to west portal of tunnel. Within last year Zimmerman has put on automobile stage line from Fort Collins to Home Post Office.

It was along line of this stage route that Mr. Hibbard was  
2241 killed.

Under Laramie County Ditch in Poudre Valley and throughout that valley habitations are permanent homes. Of course, Russians and Mexicans laboring in fields on beet crops do not have permanent habitations on farms. They move to town in winter time where they have permanent houses. All farm owners or tenants have permanent homes.

There are a great many trees throughout the Poudre Valley. Early custom was to plant trees along irrigation laterals and there  
2242 are trees throughout the whole district, mostly cottonwood species. These trees grew naturally only along streams. They originally grew along Poudre River. The entire Poudre Valley has taken on more the appearance of the prairie countries in Iowa and Illinois as far as trees are concerned.

In Laramie Plains I did not see trees except along streams. I saw no trees around ranch houses or along ditches as will be observed in Poudre Valley.

I mentioned State Agricultural College at Fort Collins and State Teachers College at Greeley. In the larger towns of the Poudre Valley they have public school systems with high schools in each, and every rural school district has good school house. School

houses are located through rural districts every few miles. I think there are upwards of 100 school districts in Larimer County.

2243 The whole section is well supplied with permanent structures, brick and frame school houses. In La Porte  $4\frac{1}{2}$  miles from Fort Collins they have lately constructed a three-story school house. They have combined five or six school districts into one and have a combined school there. Students are all hauled from their homes and back in evening. Districts are small enough to permit students to attend combined school. All districts contribute support to this one school.

State Board of Agriculture has established School of Agriculture at the State Agricultural College four years ago, and we took in pupils from all over state that have passed eighth grade. Took them into this school of agriculture and gave them course of three years of six months each. This is separate from Agricultural College course. College course is four years. Students who attend college are largely from State of Colorado and adjoining states. Some foreign countries are represented. We have one from Philippine Islands and two or three Japanese and some from old Mexico.

Enrollment of Agricultural College is about 600 and School of Agriculture about 400. The latter school has been very popular. We have had to turn away students. Do not have capacity to care for all applicants. I am president of State Board of Agriculture.

A. A. EDWARDS.

Cross-examination by Mr. N. E. Corthell:

2244 The railroad I have mentioned as being abandoned in the eighties was the Colorado Central Railroad from Fort Collins to Cheyenne, the track of which was taken up. Within the last two years another railroad has been constructed along the same general line.

2245 The country on the north side of the Poudre and above the irrigation systems is partly a grazing country, and some is used for dry farming. There is also some dry farming on the high ground between the Poudre and Big Thompson Rivers. I have heard of some pretty good crops on these dry farms some years and of failures in other years. The so-called Oklahoma district

2246 south of Windsor is in part a dry farming district, and I have heard of yields of from 20 to 30 bushels of wheat to the acre there. I never heard of a 50 bushel yield, but I have heard of entire failures. I do not know the market value of these lands. I do not know the assessed value of irrigated lands in the Poudre Valley. The system of assessment is undergoing a change.

Lands were formerly supposed to be assessed at one-third of their value, and now at the full value. My understanding is that farm land in Larimer County is assessed at about \$100 per acre, but taking all of the farm lands, I would not be surprised if they were assessed at \$67 an acre. Neither do I know the average assessed valuation of natural hay land and of dry farm

land in Larimer County. In the change in the system of assessment I doubt whether the full value was reached, as they were frequently trebling the old valuation, which was not really one-third of the real value.

2248 From July 1910 to September 1911, while I was acting as superintendent of the Greeley-Poudre system, work was being performed continuously. They were working upon the large tunnel, upon the reservoir dike called the Tunnel Reservoir, and upon the Collection ditches. I am not sure whether any work was  
2249 done there during the winter of 1910-11, except upon the short tunnels, and the rock work upon the Collection ditches, I believe. I was not up there during the winter. About the first of July, 1911, I went through the tunnel into the Laramie Valley, and at that time work had been stopped on the Collection ditches and I can not say when it had stopped. The natural trees  
2250 in the Poudre Valley are Box Elder and Cottonwood, and the native grasses are Buffalo and Gramma. I believe these grasses are quite a little different from the native grass grown in the Laramie Valley, but they may belong to the same family, I have never examined the native grasses down toward Laramie City, and they may have the same appearance as the grasses in the  
2251 Poudre Valley. When riding through the Laramie Valley in 1910 and 1912, passing from Laramie City to Woods Landing, I made no effort to investigate the agricultural conditions, but I observed them as closely as I could from an automobile. Excepting at the demonstration farm, I saw no cultivation, although I saw a field or two of alfalfa. The acreage given to the cultivation of potatoes in the Poudre Valley is materially less than it was eight or ten years ago, but has increased within the past two years. I believe that about one-fourth as much land was given to this in 1913 as in 1905 and 1906.

I believe the amount of water diverted from the Laramie River by the Skyline Ditch is about 600,000,000 cubic feet per annum, but I do not have the records, which are in Fort Collins. It might possible be 18,000 acre feet.

2252 The water available in the Poudre River has been distributed over a larger area of land from year to year as new economies are introduced in the method of use and the demand becomes greater. This extension of the use of water has been continuous ever since they began irrigating. It is also true that for at least 23 years the water commissioner has been diligent in enforcing the priority of rights in the Poudre Valley. I would say as an estimate that since 1890 the area of additional land irri-  
2253 gated in the Poudre Valley is from 35 to 40 thousand acres, an increase in 24 years of about 15 per cent. Although the Larimer County Ditch of the Water Supply and Storage Company was constructed for its entire length prior to 1890, the acreage irrigated has been constantly increased and is still being increased from year to year, the Company acquiring additional water by building reservoirs and securing water from other watersheds, and better methods in the use of the water being adopted. I believe that the

history of this ditch is typical of that of the irrigation in the Poudre Valley, although more has been done in the way of securing water from other watersheds. The duty of water under the other  
 2254 systems in the Poudre Valley is generally about the same as that in the Larimer County Ditch.

Redirect examination by Mr. Fred Farrar:

Wheat is about the only crop raised by dry farming methods. My information is that dry farming is very uncertain as to its returns. There have been two years when they have had pretty good crops, two years in succession, and previous to that I never heard  
 2254 of anything that amounted to very much of a yield. I am speaking of sections south of Fort Collins, those high ridges between there and Longmont. 1908 and 1909 were only two good years for dry farming so far as I know. Oklahoma District in Poudre Valley is high prairie country, between Poudre and Big Thompson Rivers. It lies southeast of Fort Collins.

2255 About 20 per cent of Larimer County is prairie country outside of foothills. Quite an area of this plains country lies between highest ditch and northern boundary of county. This upper portion is not under irrigation.

There are lands in Poudre Valley lying to the north aside from the Greeley-Poudre District, that are still raw prairie lands for reason that there is no water for irrigation of them. Also some land lying close to foothills.

The hay meadows of the district are distinct thing- from the raw prairie lands. The hay meadows usually grow Blue Stem Grass; the prairies, Gramma and Buffalo grasses.

2256 The Cache la Poudre River has been required to furnish some water to other appropriators with senior priorities on South Platte below mouth of Poudre.

In stating that increase of land under irrigation since 1890 was 15 per cent I was mistaken. The percentage is higher than that. Reservoir development in Poudre Valley since 1890 and water from foreign sheds had been brought in. I meant the main feeders in Poudre Valley were projected and land that could be reached by them in 1890 was not essentially different from that which we reach now, but more of it was then raw undeveloped land. Development of reservoir system and inter-mountain diversions has increased irrigated area in Poudre Valley about 100,000 acres since 1890. All the large ditch systems, especially on north side of river have extended their lines by extensions of their canals. Larimer  
 2257 County Ditch has extended 15 miles. Larimer and Weld Canal has extended 10 to 20 miles and also the same with Greeley No. 2. They have all extended further into Weld County, covering large bodies of new land. The North Poudre Irrigation Company and The Mountain Supply Ditch Company have extended their area since 1890 so as to cover new area.

Area previously devoted to potatoes in Greeley District is now

devoted to increased area in sugar beets and alfalfa. More wheat has been raised than in previous years.

Alfalfa hay ranges in price from \$5 to \$12 per ton in stack in Cache la Poudre Valley. It is now selling at \$12 per ton in stack. This hay is usually fed on the place near the stacks.

Recross-examination by Mr. N. E. Corthell:

- 2257 The present winter (1913-14) is unusual on account of the amount of snow which has fallen, and this has had some effect upon the price of hay. Previous to the heavy snows,
- 2258 however, the price was high, partly on account of the demand in Kansas and Nebraska, where there had been a dry summer. The usual price of hay from year to year is about \$5 or \$6 a ton in the stack. The return flow of water from irrigated areas is a large element in the extension of irrigation, but the return flow in the Poudre Valley reaches the stream too low to be used excepting in the Platte Valley.

Redirect examination by Mr. Fred Farrar:

- 2258 The return flow of water supplies in some measure older appropriators on Cache la Poudre Valley. The ditches lower down the river obtain it and thus leave Poudre River available at the upper part of the stream that would otherwise have to be sent down to supply the older appropriators.

[End of Volume I.]



